Special Flood Hazard Evaluation

Brimfield Ditch - Fish Creek
Portage County, Ohio

Prepared for the
Ohio Department of Natural Resources

US Army Corps
of Engineers
Buffalo District

March 1995

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This technical report documents the results of an investigation to determine the potential flood situation along Fish Creek and Brimfied Ditch within the unicorporated areas of Portage County, Ohio. The study reaches include Fish Creek from the northern corporate boundary of the City of Kent, upstream to the Summit/Portage County line and Brimfield Ditch from 5,000 feet upstream of its confluence with Breadneck Creek upstream to the Brimfield/Rootstown township boundary.

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SPECIAL FLOOD HAZARD EVALUATION REPORT
FISH CREEK AND BRIMFIELD DITCH
COUNTY OF PORTAGE, OHIO

TABLE OF CONTENTS

TABLES

FIGURES

PLATES

MAPS

SPECIAL FLOOD HAZARD EVALUATION REPORT
FISH CREEK AND BRIMFIELD DITCH
COUNTY OF PORTAGE, OHIO

INTRODUCTION

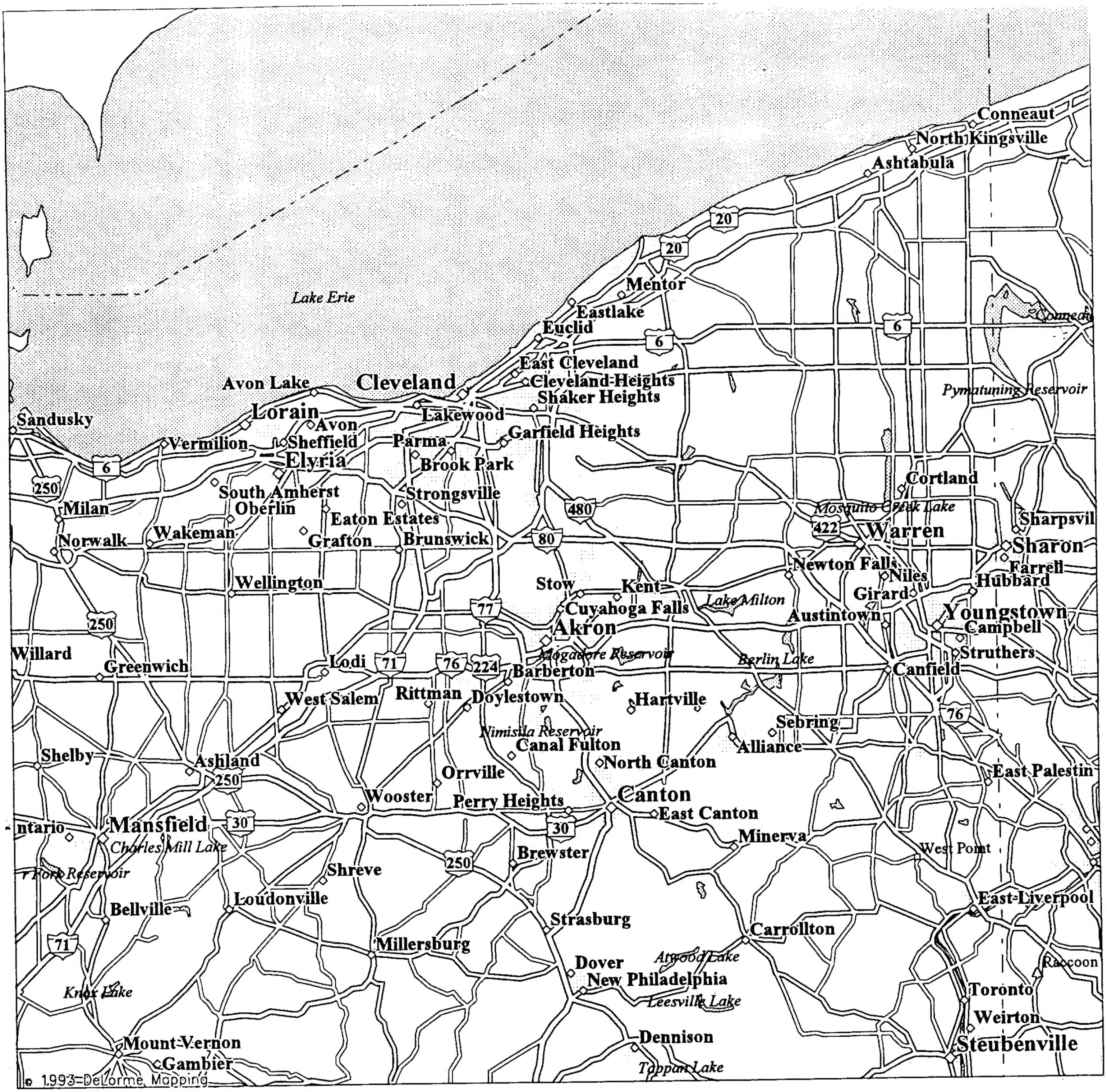
This Special Flood Hazard Evaluation Report documents the results of an investigation to determine the potential flood situation along Fish Creek and Brimfield Ditch within the unincorporated areas of Portage County, Ohio. This study was conducted at the request of the Ohio Department of Natural Resources under the authority of Section 206 of the 1960 Flood Control Act, as amended. The study reaches include Fish Creek from the northern corporate boundary of the City of Kent, upstream to the Summit/Portage County line and Brimfield Ditch from 5,000 feet upstream of its confluence with Breakneck Creek upstream to the Brimfield/Rootstown township boundary.

Portage County is located in northeastern Ohio, southeast of the city of Cleveland. The county is bordered by Geauga County to the north, Trumbull and Mahoning Counties to the east, Mahoning and Stark Counties to the south, and Summit County to the west. The County has a population of 142,585 according to the 1990 census (Reference 1).

The climate of Portage County is classified as continental with short periods of extreme cold and heat, modified by the close proximity of Lake Erie. Both Fish Creek and Brimfield Ditch are located in the western part of the county. Fish Creek originates at the Summit and Portage County border and flows generally south through Franklin Township to the Cuyahoga River. Brimfield Ditch originates in Brimfield Township, then flows northerly to Breakneck Creek, also a tributary to the Cuyahoga River. A 3-mile reach of Fish Creek was studied in Franklin Township north of the City of Kent. Brimfield Ditch was studied from about 5,000 feet upstream of its confluence with Breakneck Creek, through Brimfield Township, for approximately 2.8 miles.

Knowledge of potential floods and flood hazards is important in land use planning. This report identifies the 100-year and 500-year flood plains and 100-year floodway for the reaches studied.

Information developed for this study will be used by local officials to manage future flood plain development. While the report does not provide solutions to flood problems, it does furnish a suitable basis for the adoption of land use controls to guide flood plain development, thereby preventing intensification of the flood loss problem. It will also aid in the development of other flood damage reduction techniques to modify flooding and reduce flood damages which might be embodied in an overall Flood Plain Management (FPM) program. Other types of studies, such as those of environmental attributes and the current and future land use roles of the flood plain as part of its surroundings, would also profit from this information.



LEGEND

Population Center

Town, Small City

Large City

Interstate, Turnpike

US Highway

National Boundary

Major Street/Road

State Route

Interstate Highway

US Highway

Open Water

Scale 1:1,000,000 (at center)

20 Miles

20 KM

Vicinity Map - Portage County, Ohio
Mag 9.00
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Although Flood Insurance Rate Maps have been developed for the community, no detailed analyses was used to study the stream reaches analyzed in this study because the area was thought to have a low development potential at the time the maps were prepared. However, the western portion of the county is now experiencing residential development pressure, and local officials requested detailed flood plain information to assist them in managing development.

Additional copies of this report can be obtained from the Ohio Department of Natural Resources until its supply is exhausted, and the National Technical Information Service of the U.S. Department of Commerce, Springfield, Virginia 22161, at the cost of reproducing the report. The Buffalo District Corps of Engineers will provide technical assistance and guidance to planning agencies in the interpretation and use of the hydrologic data obtained for this study.

PRINCIPAL FLOOD PROBLEMS

Although flooding may occur during any season, the principal flood problems have occurred during winter and spring months and are usually the result of spring rains and or snowmelt.

Flood Magnitudes and Their Frequencies

Floods are classified on the basis of their frequency or recurrence interval. A 100-year flood is an event with a magnitude that can be expected to be equaled or exceeded once on the average during any 100-year period. It has a 1.0 percent chance of occurring in any given year. It is important to note that, while on a long-term basis, the exceedence averages out to once per 100 years, floods of this magnitude can occur in any given year or even in consecutive years and within any given time interval. For example, there is a greater than 50 percent probability that a 100-year event will occur during a 70-year lifetime. Additionally, a house which is built within the 100-year flood level has about a one-in-four chance of being flooded in a 30-year mortgage life.

Hazards and Damages of Large Floods

The extent of damage caused by any flood depends on the topography of the flooded area, the depth and duration of flooding, the velocity of flow, the rate of rise in water surface elevation, and development of the flood plain. Deep water flowing at a high velocity and carrying floating debris would create conditions hazardous to persons and vehicles which attempt to cross the flood plain. Generally, water 3 or more feet deep which flows at a velocity of 3 or more feet per second could easily sweep an adult off his feet and create definite danger of injury or drowning. As indicated in Table 2, flow velocities of Brimfield Ditch exceed 3 feet in the reach studied. Rapidly rising and swiftly flowing floodwater may trap persons in homes that are ultimately destroyed or in vehicles that are ultimately submerged or floated. Since water lines can be

ruptured by deposits of debris and by the force of flood waters, there is the possibility of contaminated domestic water supplies. Damaged sanitary sewer lines and sewage treatment plants could result in the pollution of floodwaters and could create health hazards. Isolation of areas by floodwater could create hazards in terms of medical, fire, or law enforcement emergencies.

HYDROLOGIC ANALYSES

Hydrologic analyses were carried out to determine the peak discharge-frequency relationships for the flooding sources affecting the community. Hydrology was developed for four reaches on Fish Creek and six reaches on Brimfield Ditch. For both streams, the peak discharges were calculated using the Graphical Peak Discharge Method of the U.S. Soil Conservation Service (Reference 2). Basin characteristics including time of concentration, drainage area, land use and soil type, and percent of watershed consisting of ponds and swamps, were calculated using the Kent, Suffield and Hudson Ohio quadrangle maps published by the U.S. Geological Survey (Reference 3). Cross sectional information developed by Buffalo District personnel were also used to develop time of concentration; and soil type was determined by Portage and Summit County soil maps.

The annual peak discharges for Fish Creek and Brimfield Ditch are shown in Table 2. The discharges at the downstream study limit for both streams are similar even though the overall drainage area for Brimfield Ditch is approximately half the drainage area of Fish Creek. The overall time of concentration for Brimfield Ditch is nearly half that of Fish Creek due to the stream characteristics and the steeper slope on Brimfield Ditch, partially compensating for the difference in drainage areas.

TABLE 1
SUMMARY OF DISCHARGES

Flooding Source and Location	Drainage Area (sq mi)	Peak Discharges 100-Year (cfs)	Peak Discharges 500-Year (cfs)
Fish Creek			
At downstream study limit (City of Kent corporate boundary)	4.73	640	1000
Just upstream of unnamed tributary (2190 feet downstream of Johnson Road)	3.44	570	860
Just upstream of unnamed tributary (2110 feet upstream of Johnson Road)	1.81	470	680
Just upstream of unnamed tributary (1250 feet downstream of Judson Road)	0.92	350	500

Brimfield Ditch			
At downstream study limit (5000 feet upstream of confluence with Breakneck Creek at State Route 59)	2.40	640	990
Just upstream of unnamed tributary (50 feet downstream of Summit Road)	2.09	570	880
Just downstream of Cline Road	1.93	520	800
Just downstream of Meloy Road	1.76	460	720
Approximately 2100 feet upstream of Meloy Road	1.48	390	620
Just upstream of unnamed tributary 2600 feet downstream of Sandy Lake Road	0.41	130	190

HYDRAULIC ANALYSES

Analyses of the hydraulic characteristics of flooding from sources studies were carried out to provide estimates of the elevations of floods for the 100-year and 500-year recurrence intervals.

Cross-section data for the backwater analyses of Fish Creek and Brimfield Ditch were obtained from field surveys performed by Buffalo District personnel in May 1994. Additional data were obtained from topographic maps (Reference 3). All bridges and culverts were surveyed to determine elevation data and structural geometry. Spot elevations were obtained in the overbank areas in order to accurately delineate the flood plain boundaries.

Water surface elevations of the 100-year and 500-year recurrence interval flood events were computed using the COE HEC-2 step-backwater computer program (Reference 4). The starting water surface elevation for Fish Creek was taken from the existing Flood Insurance Study for the City of Kent, Ohio (Reference 5) 100 feet downstream of the corporate limit. The slope-area method was used to establish the starting water surface elevation for Brimfield Ditch.

Locations of the selected cross-sections used in the hydraulic analyses are shown on the Flood Profiles (Plates 1 and 2) and on the Flooded Areas Maps which accompany this report.

Channel and overbank roughness factors (Manning's "n") used in the hydraulic computations were selected using engineering judgement and were based on field observations of the stream and flood plain areas. The values for Manning's "n" and the contraction and expansion coefficients are shown in Table 2.

TABLE 2

MANNING'S "N" AND CONTRACTION & EXPANSION COEFFICIENTS

Flooding Source	Channel	Overbank	Contraction	Expansion
Brimfield Ditch	.030-.050	.030-.080	.1 - .4	.3 - .6
Fish Creek	.035-.050	.035-.095	.1 - .3	.3 - .5

Flood profiles were drawn showing the computed water surface elevations for the selected recurrence intervals. The flood plain boundaries were delineated using the flood elevations determined at each cross section. Between cross sections, the boundaries were interpolated using the topographic maps and spot elevations obtained during the field surveys. Small areas within the flood plain boundaries may be above the flood elevations, but cannot be shown due to limitations of the map scale and/or lack of detailed topographic data.

Floodways were determined for the streams studied in detail. Floodway encroachments were based on equal conveyance reduction from each side of the flood plain, with adjustments as necessary to provide functional and manageable floodways. At the request of the Ohio Department of Natural Resources, the maximum increase in stage due to encroachment was limited to 1 foot, provided that hazardous velocities were not produced. Floodway widths were computed at cross sections and varied from 12 to 127 feet for Brimfield Ditch and 70 to 804 feet for Fish Creek. Between cross sections, the floodway boundaries were interpolated. The results of the floodway computations are tabulated for selected cross sections and are shown in Table 3.

The computed floodways are also shown on the Flooded Area Maps. In cases where the floodway and the 100-year flood plain boundaries are either close together or collinear, only the floodway boundary is shown.

The hydraulic analyses for this study were based on unobstructed flow. The flood elevations shown on the profile are considered valid only if hydraulic structures remain unobstructed, operate properly, and do no fail.

All elevations are referenced to the National Geodetic Vertical Datum of 1929 (NGVD). Descriptions of the marks are presented in Table 4.

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY (FEET NGVD)	WITH FLOODWAY (FEET NGVD)	INCREASE
A	5455	116	234	2.7	1045.1	1045.1	1046.1	1.0
B	6905	39	184	3.5	1049.2	1049.2	1049.8	0.6
C	8585	127	135	4.2	1051.7	1051.7	1052.5	0.8
D	10045	22	87	6.0	1059.0	1059.0	1059.0	0.0
E	10874	40	158	3.3	1062.9	1062.9	1063.8	0.9
F	12385	80	457	1.0	1072.5	1072.5	1072.5	0.0
G	14000	85	327	1.2	1072.7	1072.7	1072.9	0.2
H	15830	19	70	1.9	1074.1	1074.1	1074.9	0.8
J	16700	28	41	3.2	1075.2	1075.2	1075.9	0.7
K	18195	13	34	3.8	1081.6	1081.6	1081.7	0.1
L	19200	30	80	1.6	1086.6	1086.6	1086.7	0.1
M	20000	12	39	3.3	1087.3	1087.3	1088.1	0.8
N	20880	40	83	1.6	1089.3	1089.3	1090.3	1.0

1 Distance is measured in feet above confluence with Breakneck Creek at State Route 59.

TABLE 3

PORTAGE COUNTY, OHIO
(Unincorporated areas)

FLOODWAY DATA

BRIMFIELD DITCH

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY (FEET NGVD)	WITH FLOODWAY (FEET NGVD)	INCREASE
A	19350	80	328	2.0	1034.3	1034.3	1034.8	0.5
B	21200	124	547	1.0	1035.1	1035.1	1035.7	0.6
C	23110	200	917	0.6	1037.0	1037.0	1037.7	0.7
D	25500	70	266	1.8	1037.0	1037.0	1037.7	0.7
E	28120	752	3153	0.1	1046.1	1046.1	1046.1	0.0
F	28630	804	4603	0.1	1046.1	1046.1	1046.1	0.0
G	30120	284	402	0.9	1046.2	1046.2	1046.2	0.0
H	31665	154	220	1.6	1050.5	1050.5	1050.9	0.4

1 Distance is measured in feet from the confluence with Cuyahoga River.

TABLE 3

PORTAGE COUNTY, OHIO
(Unincorporated areas)

FLOODWAY DATA

FISH CREEK

TABLE 4

ELEVATION REFERENCE MARKS

Reference Mark	Elevation (feet NGVD)	Description
Brimfield Ditch		
RM-1	1096.44	Monument "102 LLB 1958 1096", a standard brass disk set in concrete at ground level; located 3.0 miles west of Route 44 along Lynn Road, approximately 16 feet south and 10 feet west of feeder canal.
RM-2	1109.04	Spike in east side of power pole "83/21/25-AMP-T," 0.6 feet above ground level; located at northeast corner of intersection of Lynn and Sandy Lake Road.
RM-3	1068.99	Upstream end of 6 x 40 foot CMP for Brimfield Ditch at top of Meloy Road; mark is a 1/4" drill hole colored yellow.
RM-4	1074.71	Top of square steel plate at intersection of Cline Road and Troyer.
RM-5	1049.20	Brass disk "City of Kent FR-03-01" located at northeast corner of intersection of Summit Road and Hodgeman Lane.
Fish Creek		
RM-6	1036.11	Chiseled "+" on top of north downstream culvert under the N&W railroad.
RM-7	1038.81	PK in power pole "57BD/1-4" located on the south side of Johnson Road just west of Fish Creek about 2 feet above ground level.
RM-8	1038.18	Chiseled "+" on top of downstream headwall of Johnson Road culvert at tributary of Fish Creek.
RM-9	1040.02	Chiseled "+" on top of downstream (south) end of CMP at Spell Road over Fish Creek.
RM-10	1043.70	Chiseled "+" on top of upstream (north) end of culvert at Shawnee Drive over Fish Creek.
RM-11	1051.51	PK nail in power pole "12/39" on upstream east bank at Judson Road and Fish Creek.

UNIFIED FLOOD PLAIN MANAGEMENT

Historically, the alleviation of flood damage has been accomplished almost exclusively by the construction of protective works such as reservoirs, channel improvements, and floodwalls and levees. However, in spite of the billions of dollars that have already been spent for construction of well-designed and efficient flood control works, annual flood damages continue to increase because the number of persons and structures occupying floodprone lands is increasing faster than protective works can be provided.

Recognition of this trend has forced a reassessment of the flood control concept and resulted in the broadened concept of unified flood plain management programs. Legislative and administrative policies frequently cite two approaches: structural and nonstructural, for adjusting to the flood hazard. In this context, "structural" is usually intended to mean adjustments that modify the behavior of floodwaters through the use of measures such as dams and channel work. "Nonstructural" is usually intended to include all other adjustments in the way society acts when occupying or modifying a flood plain (e.g., regulations, floodproofing, insurance, etc.). Both structural and nonstructural tools are used for achieving desired future flood plain conditions. There are three basic strategies which may be applied individually or in combination: (1) modifying the susceptibility to flood damage and disruption, (2) modifying the floods themselves, and (3) modifying (reducing) the adverse impacts of floods on the individual and the community.

Modify Susceptibility to Flood Damage and Disruption

The strategy to modify susceptibility to flood damage and disruption consists of actions to avoid dangerous, economically undesirable, or unwise use of the flood plain. Responsibility for implementing such actions rests largely with the non-Federal sector and primarily at the local level of government.

These actions include restrictions in the mode and the time of occupancy; in the ways and means of access; in the pattern, density, and elevation of structures and in the character of their materials (structural strength, adsorptiveness, solubility, corrodibility); in the shape and type of buildings and in their contents; and in the appurtenant facilities and landscaping of the grounds. The strategy may also necessitate changes in the interdependencies between flood plains and surrounding areas not subject to flooding, especially interdependencies regarding utilities and commerce. Implementing mechanisms for these actions include land use regulations, development and redevelopment policies, floodproofing, disaster preparedness and response plans, and flood forecasting and warning systems.

Different tools may be more suitable for developed or underdeveloped flood plain or for urban or rural areas. The information contained in this report is particularly useful for the preparation of flood plain regulations.

a. Flood Plain Regulations.

Flood plain regulations apply to the full range of ordinances and other means designed to control land use and construction within floodprone areas. The term encompasses zoning ordinances, subdivision regulations, building and housing codes, encroachment line statutes, open area regulations, and other similar methods of management which affect the use and development of floodprone areas.

Flood plain land use management does not prohibit use of floodprone areas; to the contrary, flood plain land use management seeks the best use of flood plain lands. The flooded area maps and the water surface profiles contained in this report can be used to guide development in the flood plain. The elevations shown on the profile should be used to determine flood heights because they are more accurate than the outlines of flooded areas. It is recommended that development in areas susceptible to frequent flooding adhere to the principles expressed in Executive Order 11988 - Flood Plain Management, whose objective is to "... avoid to the extent possible the long- and short-term adverse impacts associated with the occupancy and modification of flood plains ... whenever there is a practicable alternative." Accordingly, development in areas susceptible to frequent flooding should consist of construction which has a low damage potential such as parking areas, parks, and golf courses. High value construction such as buildings, should be located outside the flood plain to the fullest extent possible. In instances where no practicable alternative exists, the land should be elevated to minimize damages. If it is uneconomical to elevate the land in these areas, means of floodproofing the structure should be given careful consideration.

b. Development Zones.

A flood plain consists of two zones. The first zone is the designated "floodway" or that cross sectional area required for carrying or discharging the anticipated flood waters with a maximum 1-foot increase in flood level (Ohio Department of Natural Resources standard). Velocities are the greatest and most damaging in the floodway. Regulations essentially maintain the flow-conveying capability of the floodway to minimize inundation of additional adjacent areas. Uses which are acceptable for floodways include parks, parking areas, open spaces, etc.

The second zone of the flood plain is termed the "floodway fringe" or restrictive zone, in which inundation might occur but where depths and velocities are generally low. Although not recommended if practicable alternatives exist, such areas can be developed provided structures are placed high enough or floodproofed to be reasonably free from flood damage during the 100-year flood. Typical relationships between the floodway and floodway fringe are shown in Figure 2. The floodways for Brimfield Ditch and Fish Creek have been plotted on the Flooded Area Maps.

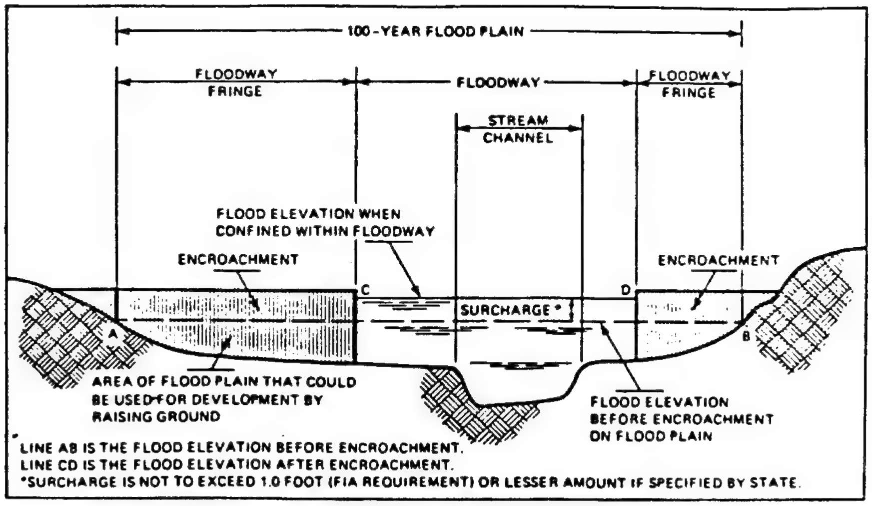

Figure 2 - Floodway Schematic

c. Formulation of Flood Plain Regulations.

Formulation of flood plain regulations in a simplified sense involves selecting the type and degree of control to be exercised for each specific flood plain. In principle, the form of the regulations is not as important as a maintained adequacy of control. The degree of control normally varies with the flood hazard as measured by depth of inundation, velocity of flow, frequency of flooding, and the need for available land. Considerable planning and research is required for the proper formulation of flood plain regulations. Formulation of flood plain regulations may require a lengthy period of time during which development is likely to occur. In such cases, temporary regulations should be adopted and amended later as necessary.

Modify Flooding

The traditional strategy of modifying floods through the construction of dams, dikes, levees and floodwalls, channel alterations, high flow diversions and spillways, and land treatment measures has repeatedly demonstrated its effectiveness for protecting property and saving lives, and it will continue to be a strategy of flood plain management. However, in the future, reliance solely upon a flood modification strategy is neither possible nor desirable. Although the large capital investment required by flood modifying tools has been provided largely by the Federal government, sufficient funds from Federal sources have not been and are not likely to be available to meet all situations for which flood modifying measures would be both effective and economically feasible. Another consideration is that the cost of maintaining and operating flood control structures falls upon local governments.

Flood modifications acting alone leave a residual flood loss potential and can encourage an unwarranted sense of security leading to inappropriate use of lands in the areas that are directly protected or in adjacent areas. For this reason, measures to modify possible floods should usually be accompanied by measures to modify the susceptibility to flood damage, particularly by land use regulations.

Modify the Impact of Flooding on Individuals and the Community

A third strategy for mitigating flood losses consists of actions designed to assist individuals and communities in their preparatory, survival, and recovery responses to floods. Tools include information dissemination and education, arrangements for spreading the costs of the loss over time, purposeful transfer of some of the individual's loss to the community by reducing taxes in flood prone areas, and the purchase of Federally subsidized flood insurance.

The distinction between a reasonable and unreasonable transfer of costs from the individual to the community can also be regulated and is a key to effective flood plain management.

CONCLUSION

This report presents local flood hazard information for Brimfield Ditch and Fish Creek in the unincorporated areas of Portage County, Ohio. The U.S. Army Corps of Engineers, Buffalo District, will provide interpretation in the application of the data contained in this report, particularly as to its use in developing effective flood plain regulations. Requests should be coordinated with the Ohio Department of Natural Resources.

GLOSSARY

BACKWATER EFFECT	The resulting rise in water surface in a given stream due to a downstream obstruction or high stages in an intersecting stream.
BASE FLOOD	A flood which has an average return interval in the order of once in 100 years, although the flood may occur in any year. It is based on statistical analysis of streamflow records available for the watershed and analysis of rainfall and runoff characteristics in the general region of the watershed. It is commonly referred to as the "100-year flood."
DISCHARGE	The quantity of flow in a stream at any given time, usually measured in cubic feet per second (cfs).
FLOOD	An overflow of lands not normally covered by water. Floods have two essential characteristics: the inundation of land is temporary and the lands are adjacent to and inundated by overflow from a river, stream, ocean, lake, or other body of standing water. Normally a "flood" is considered as any temporary rise in streamflow or stage, but not the ponding of surface water, that results in significant adverse effects in the vicinity. Adverse effects may include damages from overflow of land areas, temporary backwater effects in sewers and local drainage channels, creation of unsanitary conditions or other unfavorable situations by deposition of materials in stream channels during flood recessions, and rise of groundwater coincident with increased streamflow.
FLOOD CREST	The maximum stage or elevation reached by floodwaters at a given location.
FLOOD FREQUENCY	A statistical expression of the percent chance of exceeding a discharge of a given magnitude in any given year. For example, a <u>100-year flood</u> has a magnitude expected to be exceeded on the average of once every hundred years. Such a <u>flood</u> has a 1 percent chance of being exceeded in any given year. Often used interchangeably with <u>RECURRENCE INTERVAL</u>.

FLOOD PLAIN	The areas adjoining a river, stream, watercourse, ocean, lake, or other body of standing water that have been or may be covered by floodwater.
FLOOD PROFILE	A graph showing the relationship of water surface elevation to location; the latter generally expressed as distance upstream from a known point along the approximate centerline of a stream of water that flows in an open channel. It is generally drawn to show surface elevation for the rest of a specific flood, but may be prepared for conditions at a given time or stage.
FLOOD STAGE	The stage or elevation at which overflow of the natural banks of a stream or body of water begins in the reach or area in which the elevation is measured.
FLOODWAY	The channel of a watercourse and those portions of the adjoining flood plain required to provide for the passage of the selected flood (normally the 100-year flood) with an insignificant increase in the flood levels above that of natural conditions. As used in the National Flood Insurance Program, floodways must be large enough to pass the 100-year flood without causing an increase in elevation of more than a specified amount (1 foot in most areas).
RECURRENCE INTERVAL	A statistical expression of the average time between floods exceeding a given magnitude (see FLOOD FREQUENCY).

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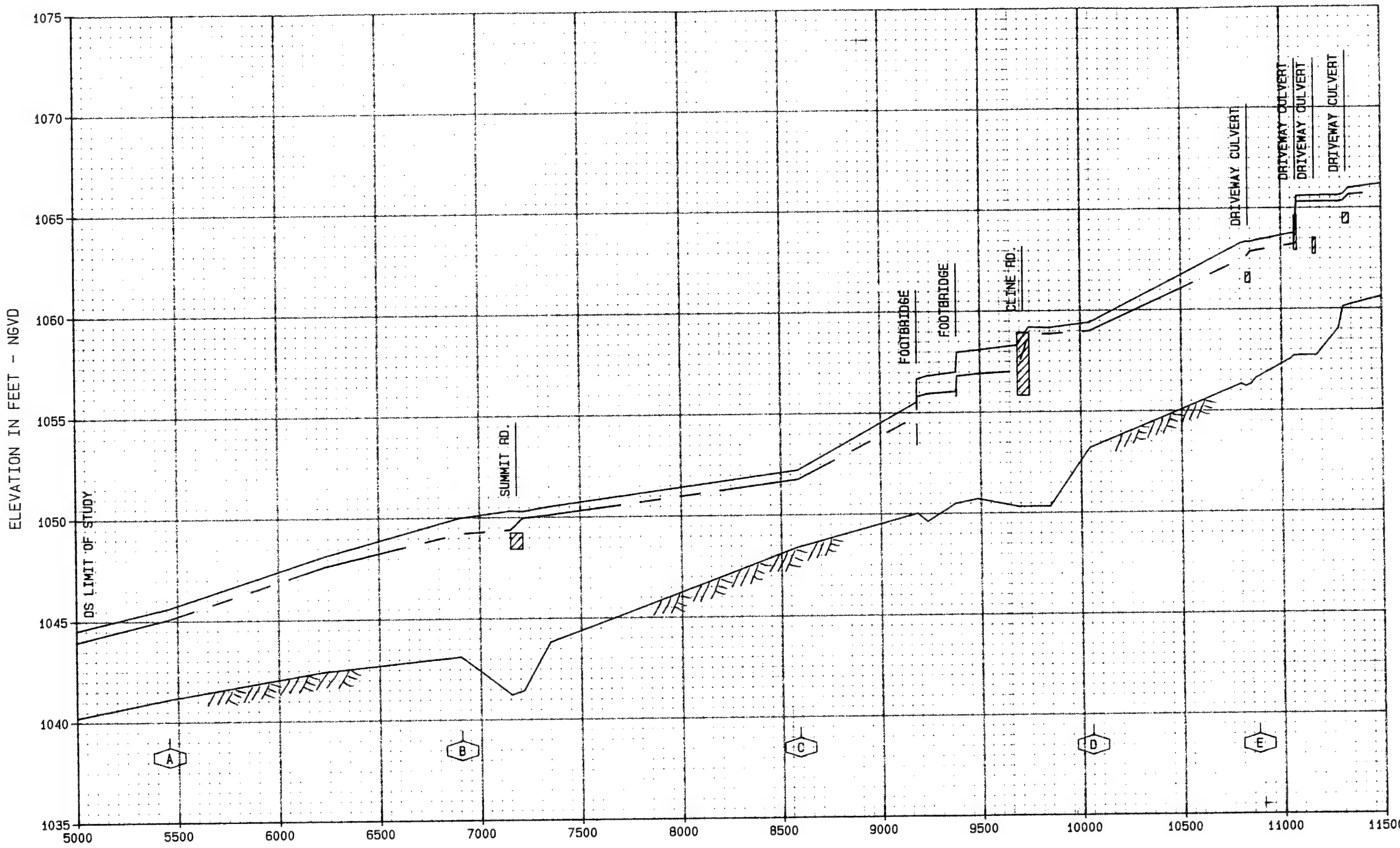
FY-95 ILIR PROJECTS

DTIC #	WUP	Title	PIs Name	Code	Phone	DoD Crit	Nav Crit	ONR SE	OSD S & T TH	Key Tech	JMA 1	JMA 2	APP 1	APP 2	Auth. FY-94 ($K)	Auth. FY-95 ($K)	Planned FY-96 ($K)	Key Words
103298	01050V20	Neural Net Modeling for Image Analysis	Dr. William Schmidt	4.5	(215) 441-2355	SIGPRO	INFTEC	15	2,3	2	AAW	ASW	AAW	ASW	65.0	5.0	0.0	Interception, Sensors, Cloud, Clutter, Time Domain
124034	01050V21	Intelligent Image Fusion	Dr. Ramnandan Singh	4.5	(215) 441-3491	DATFUS	INFTEC	14,15	2,3	2	ASW	_	ASW	SBS	0.0	90.0	130.0	Multi-assignment, Image fusion
01B1421	01050V22	Minimum Average Correlation Energy Optimization Using Genetic Algorithm	Larry Venetsky	4.8	(908) 323-7073	SIGPRO	INFTEC	15	1,3	2	STRIKE	ASW	ASW	_	100.0	80.0	128.0	Multiclass Pattern, Synthesize
104757	01050V23	Investigation of Sodium Mobility in Glass Ceramics	Dr. Shao-Wang	4.3	(215) 441-3956	COMPOS	ADVMAT	22	7	7	STRIKE	FSO	MWT	FSO	70.0	63.0	126.0	Diffusion,CMC, Fluxing
124034	01050V25	Modeling of Airway Deposition	Dr. Jonathan Kaufman	4.6	(215) 441-2565	BIOTEC	PMD	41	7	11	SUPPORT	_	MWT	MOB	15.0	63.0	126.0	Airway Segment, Inter-Airway, Ventilation
														Totals	1,332.4	1,502.0	1,716.0	

Key:

DoD Crit = DoD Critical Technologies
Nav Crit = Navy Critical Technologies
ONR SE = ONR Research Area Sub-Elements
OSD S&T TH = OSD Science & Technology Thrusts
Key Tech = Key Technologies
JMA 1, 2 = Joint Mission Areas
APP 1, 2 = Applicability Code



Distance is measured in feet Upstream from Confluence with Breackneck Creek at S.R. 59

Legend:
100-YR. FLOOD
500-YR. FLOOD

Cross Section

Stream bed

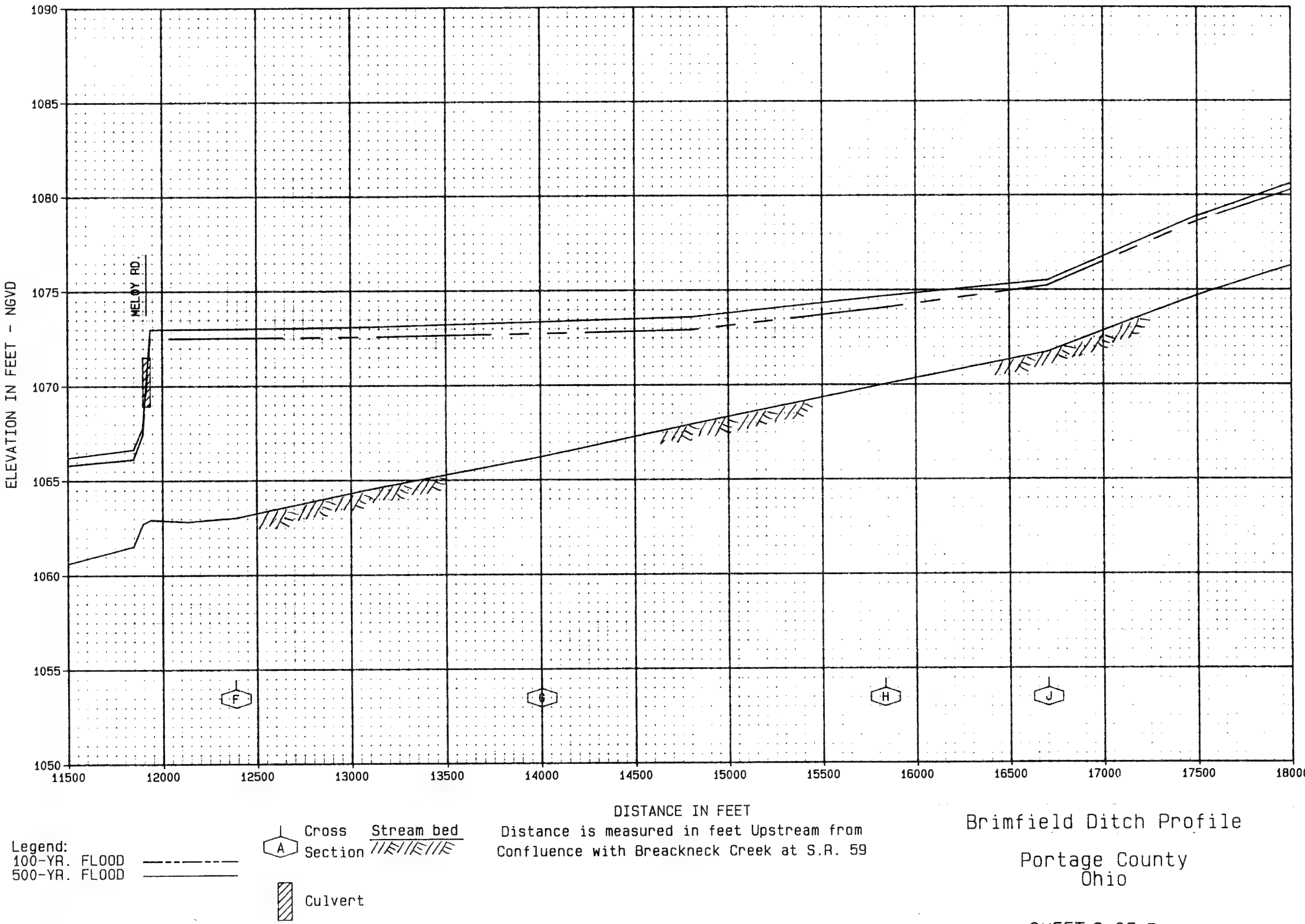
Culvert

Bridge

Brimfield Ditch Profile

Portage County
Ohio

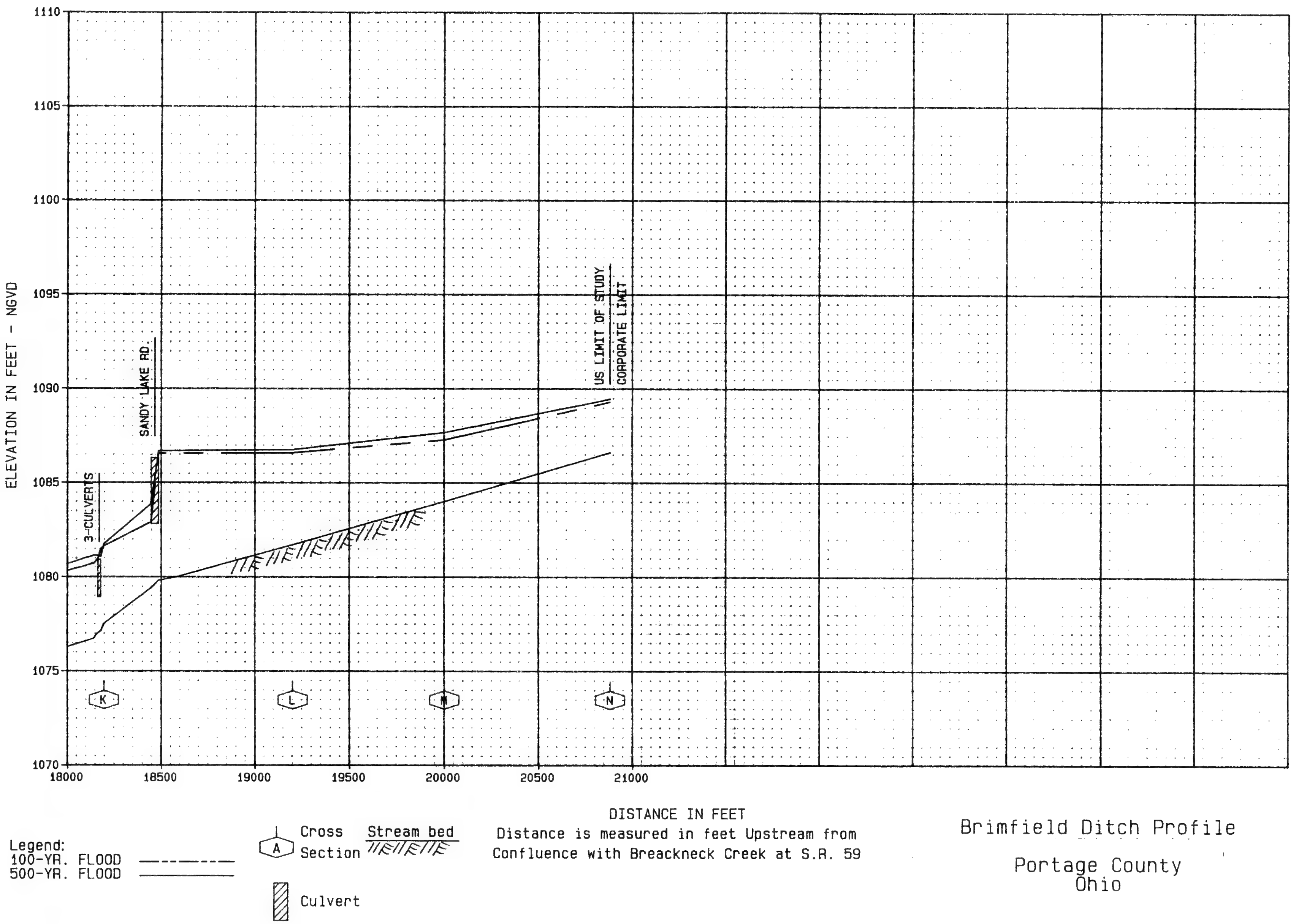
SHEET 1 OF 3



Brimfield Ditch Profile

Portage County
Ohio

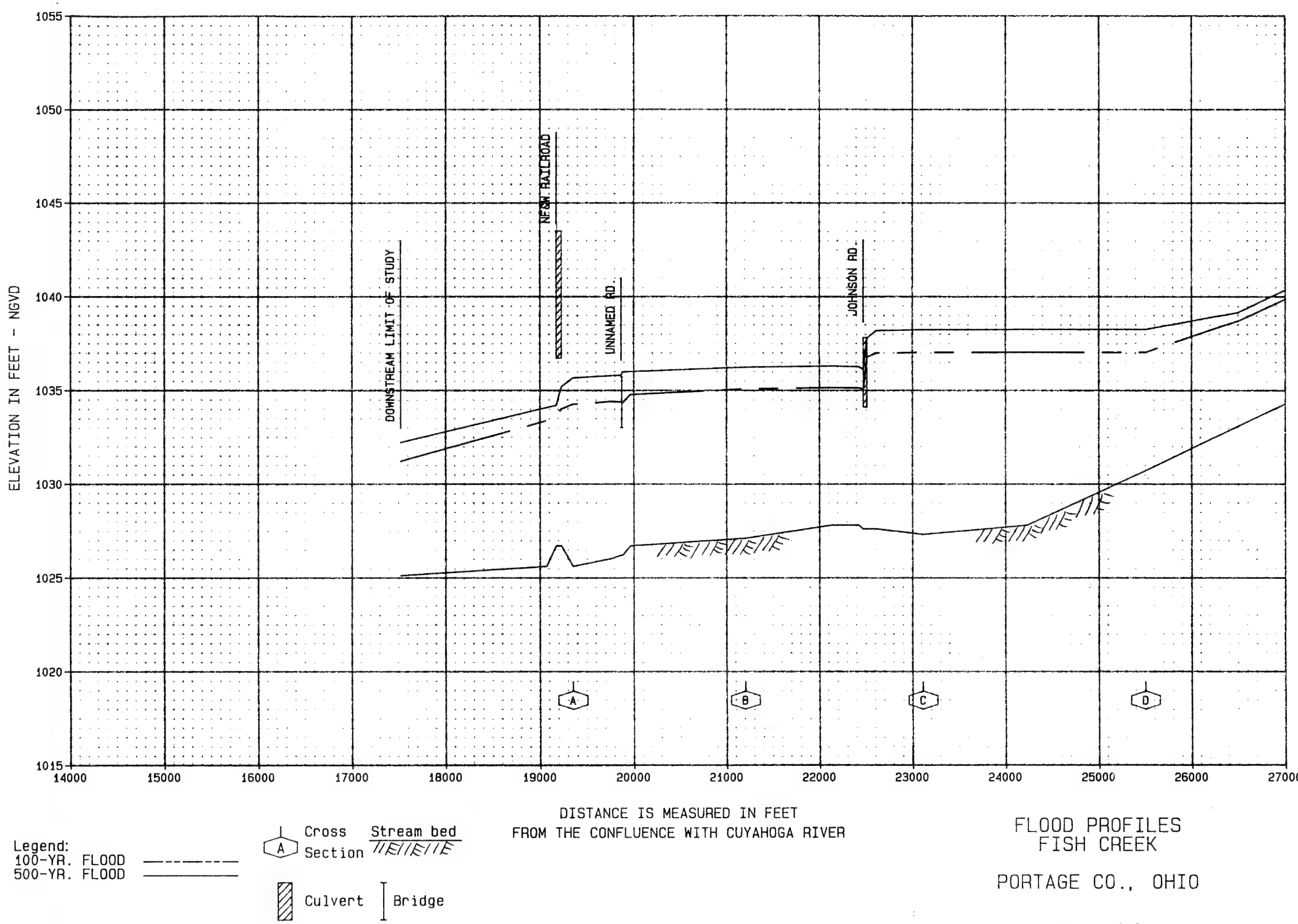
SHEET 2 OF 3



Brimfield Ditch Profile

Portage County
Ohio

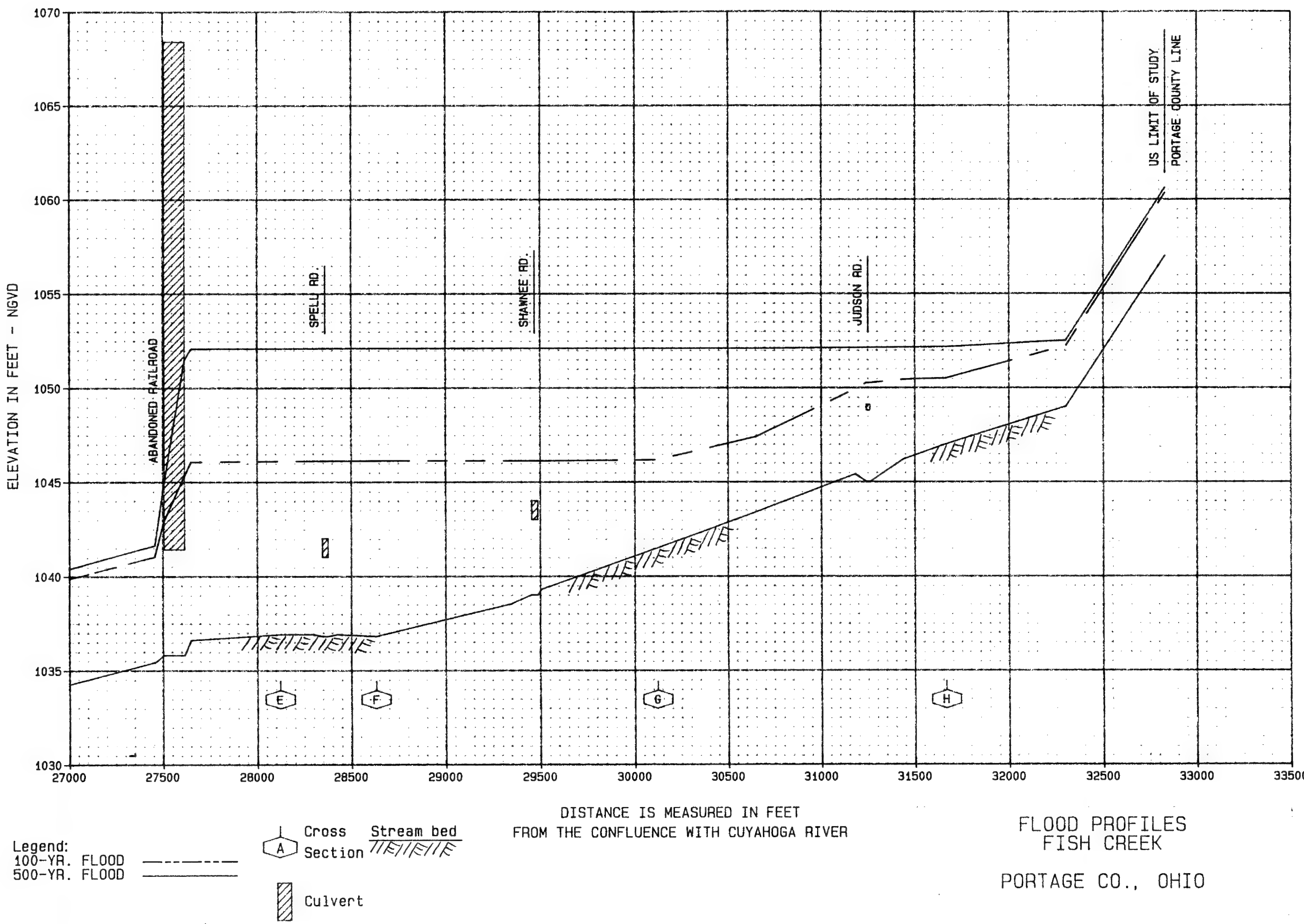
SHEET 3 OF 3



FLOOD PROFILES
FISH CREEK

PORTAGE CO., OHIO

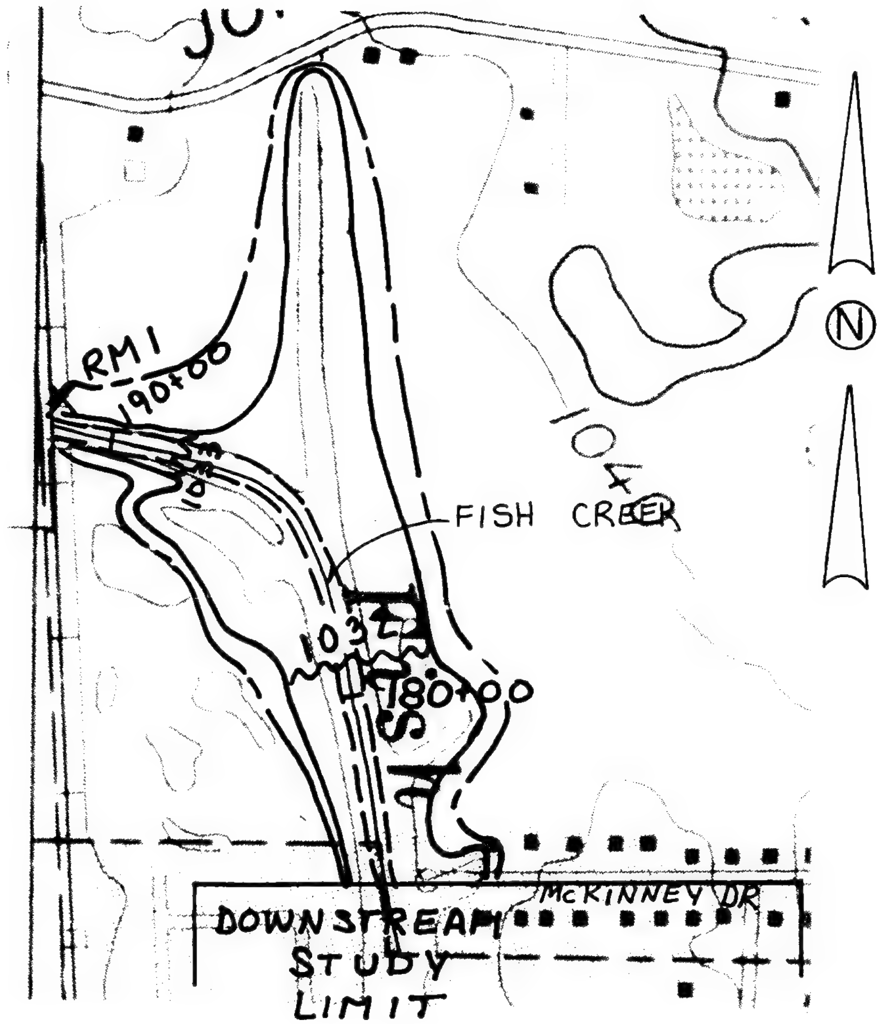
SHEET 1 OF 2



FLOOD PROFILES
FISH CREEK

PORTAGE CO., OHIO

SHEET 2 OF 2

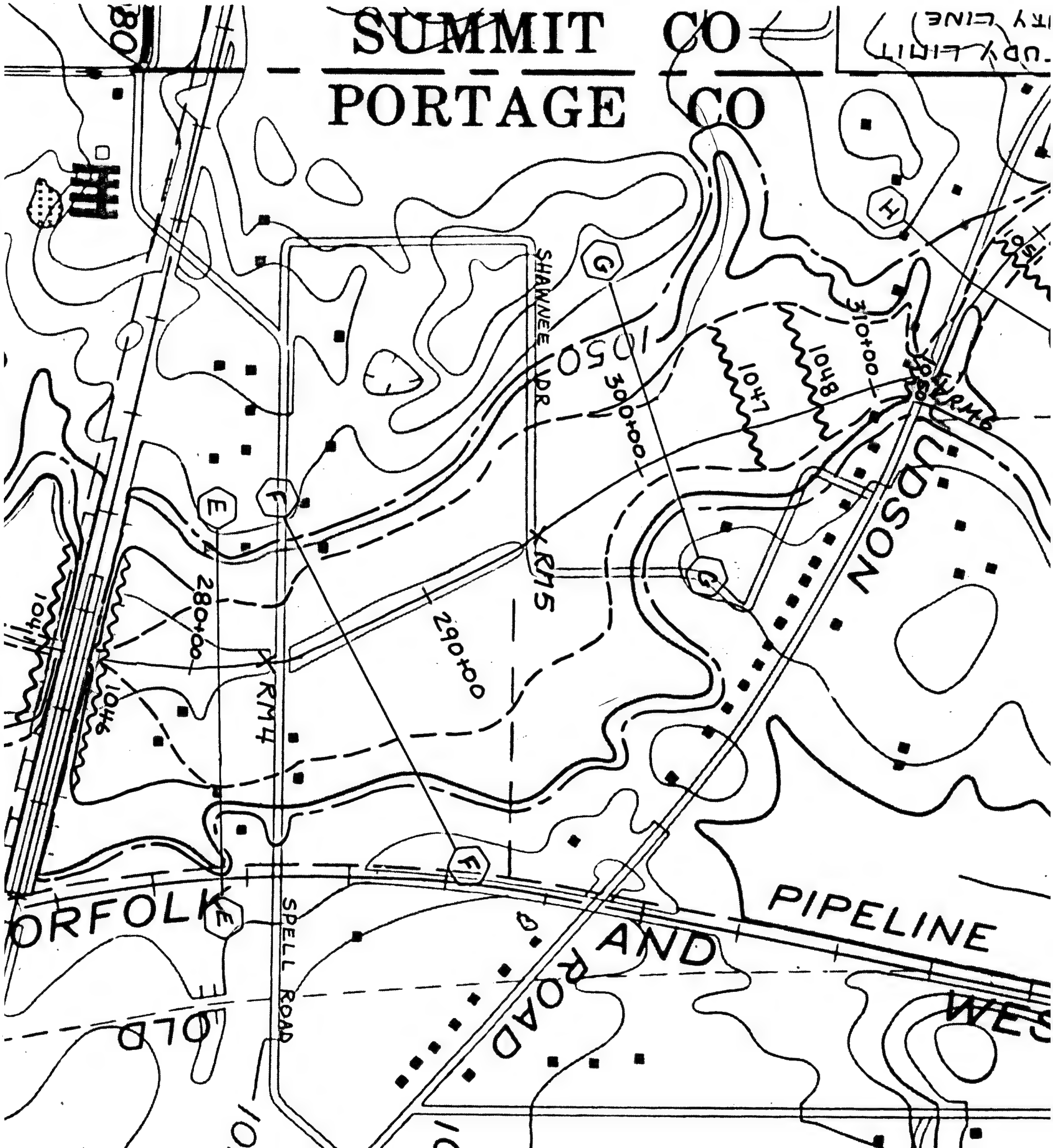


SCALE: 1 INCH = 500 FEET

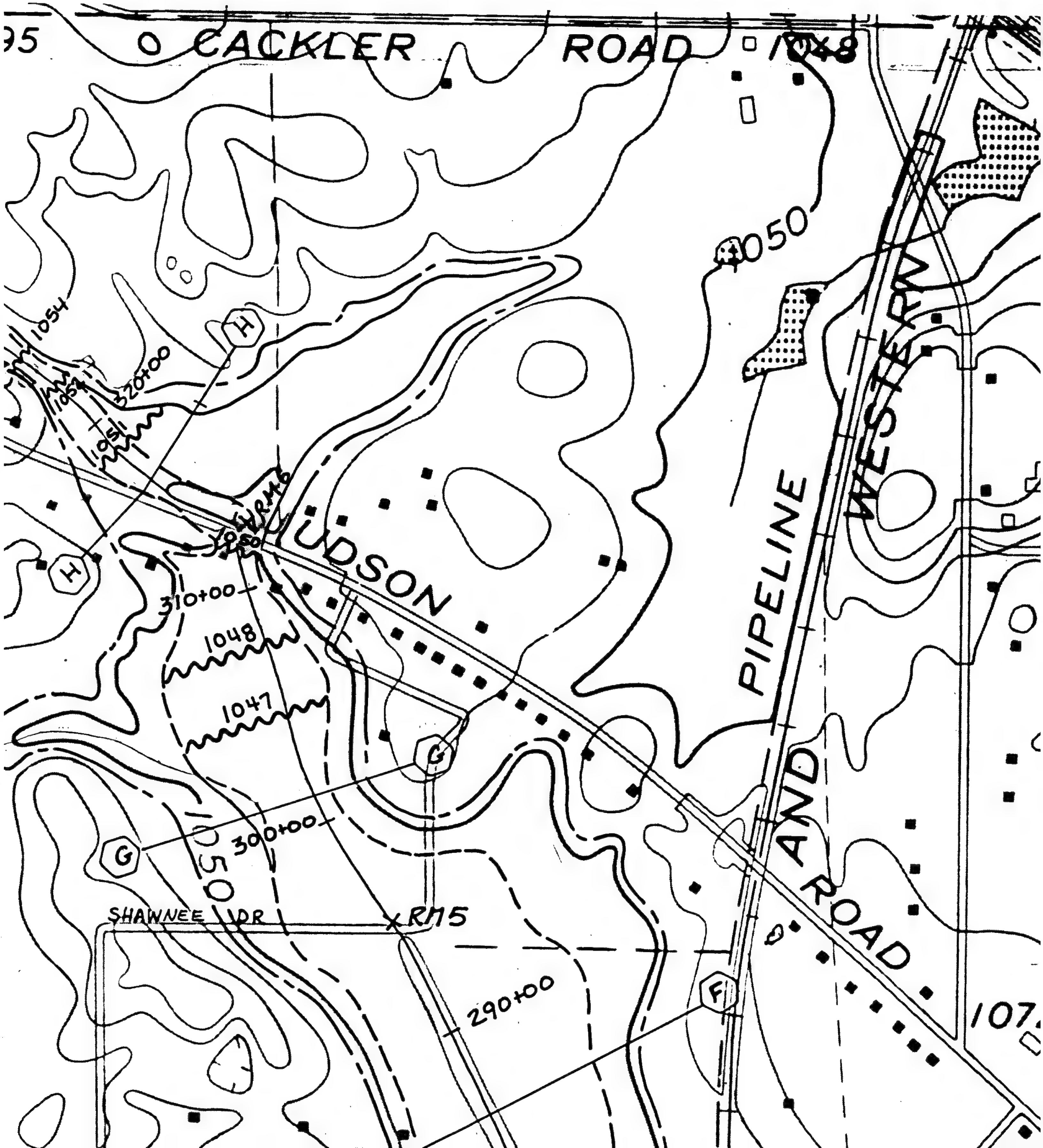
U.S. Army Engineer District, Buffalo
SPECIAL FLOOD HAZARD EVALUATION

FLOODED AREA MAP
FISH CREEK
PORTAGE COUNTY, OHIO

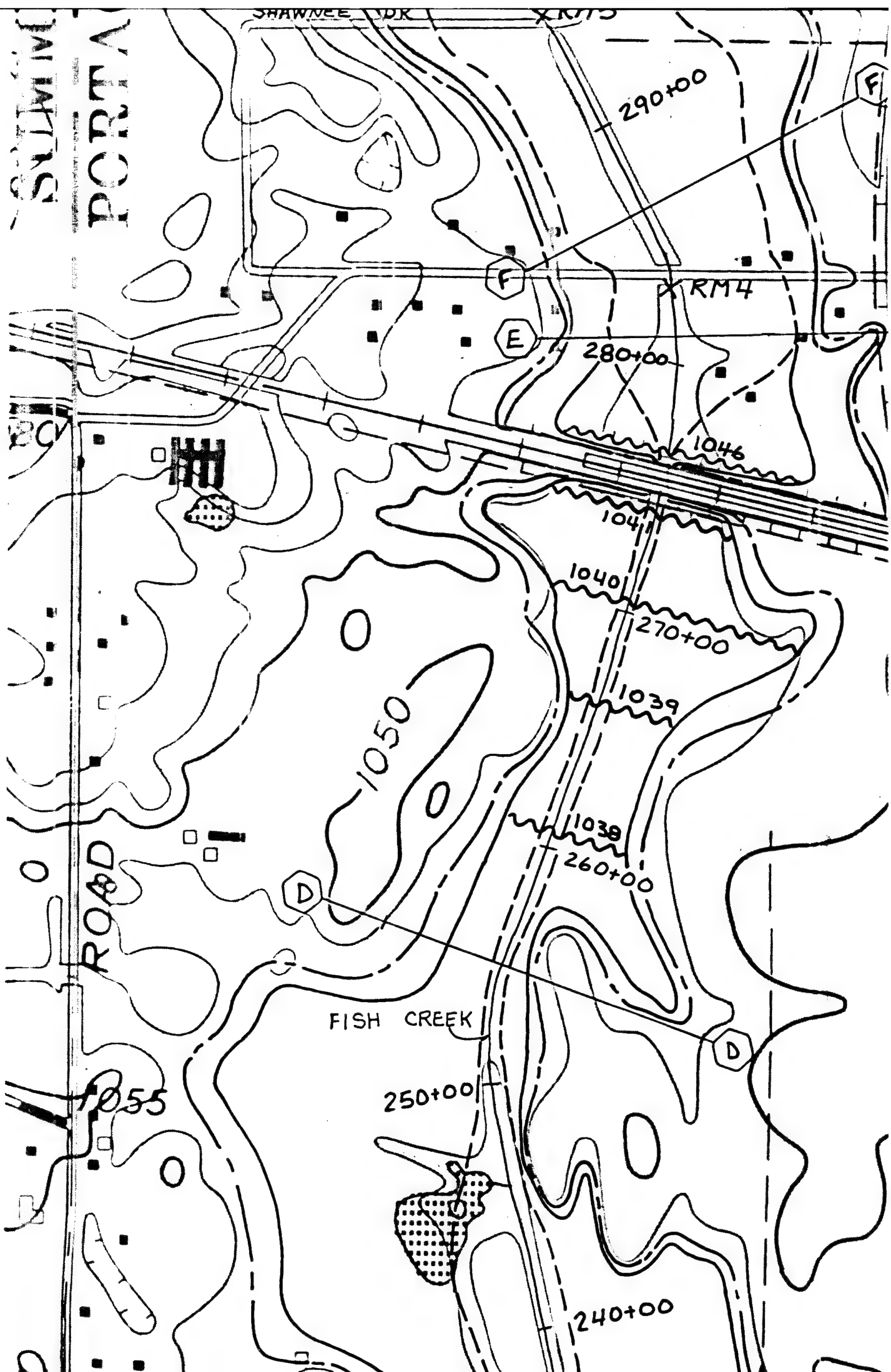
SHEET 1 OF 2 MARCH 1995



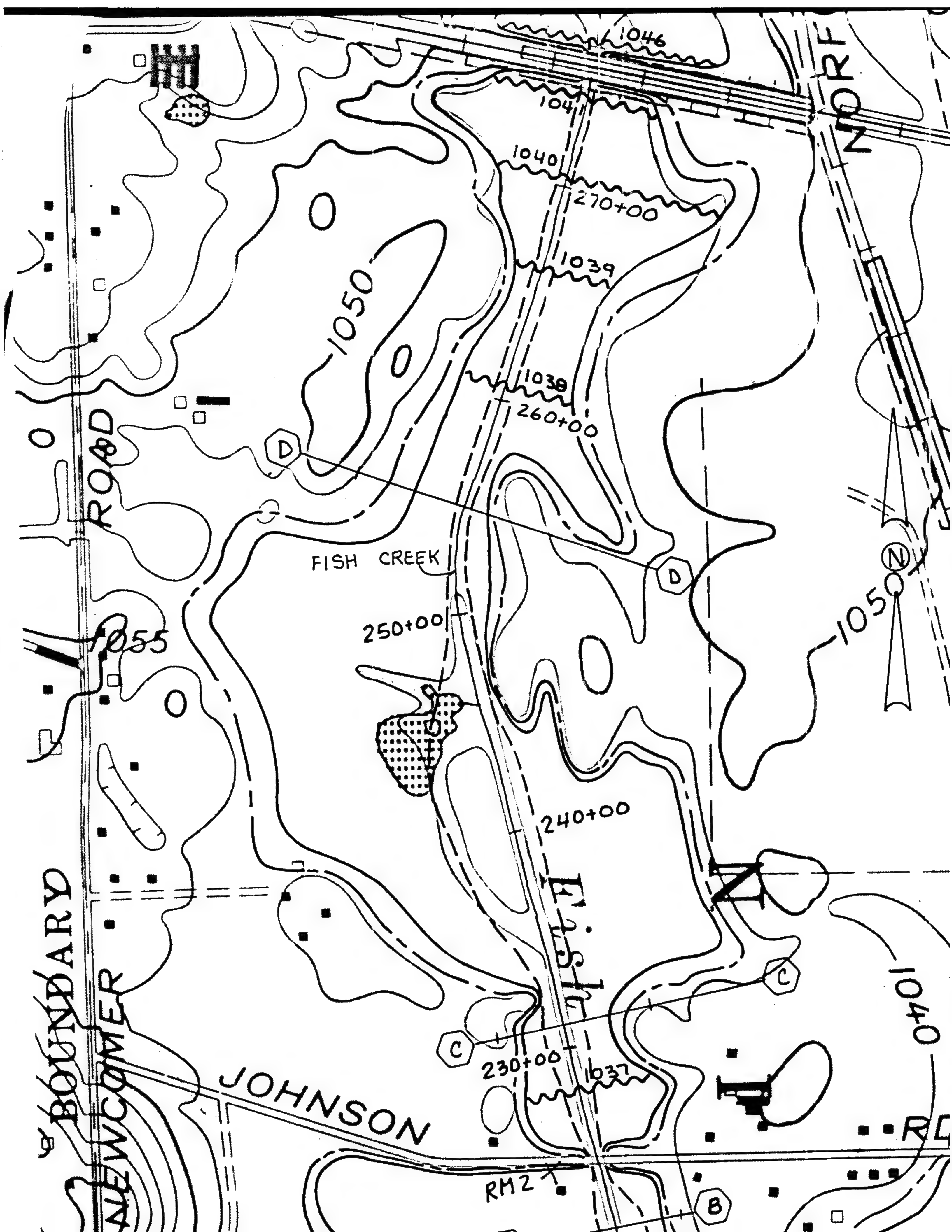
SUMMIT CO
PORTAGE CO
SHAWNEE DR
1050
300+00
1047
1048
310+00
RM6
RM5
280+00
290+00
RM4
1046
1041
JUDSON
PIPELINE
ORFOLK
SPELL ROAD
AND
ROAD
OLD



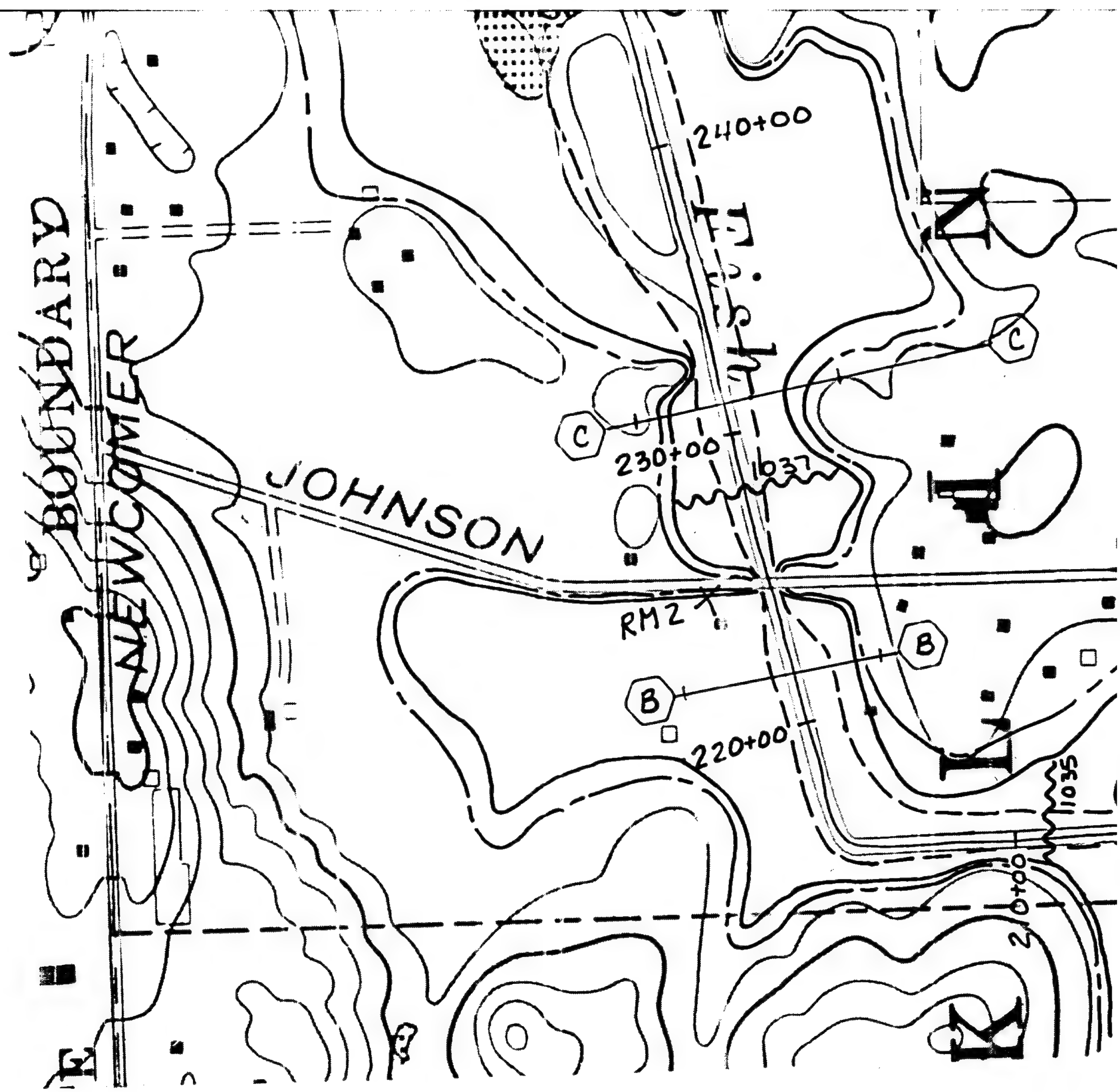
95
CACKLER
ROAD
1048
1050
1054
1054
320+00
1051
H
RM6
1050
UDSON
310+00
1048
1047
G
G
300+00
1050
SHAWNEE DR
RM5
290+00
F
PIPELINE
AND
ROAD
WESTERN
107



SHAWNEE DR
RM5
290+00
F
F
RM4
E
280+00
1046
1041
1040
270+00
1039
1050
1038
260+00
D
D
ROAD
FISH CREEK
250+00
1055
240+00
SUMM
PORTA



1046
104
1040
270+00
1039
1050
1038
260+00
ROAD
D
D
FISH CREEK
250+00
1055
105
N
240+00
Fish
BOUNDARY
NEWCOMER
C
C
230+00
1037
1040
JOHNSON
RD
RM2
B
NORF



LEGEND

500 YEAR FLOOD PLAIN BOUNDARY

100 YEAR FLOOD PLAIN BOUNDARY

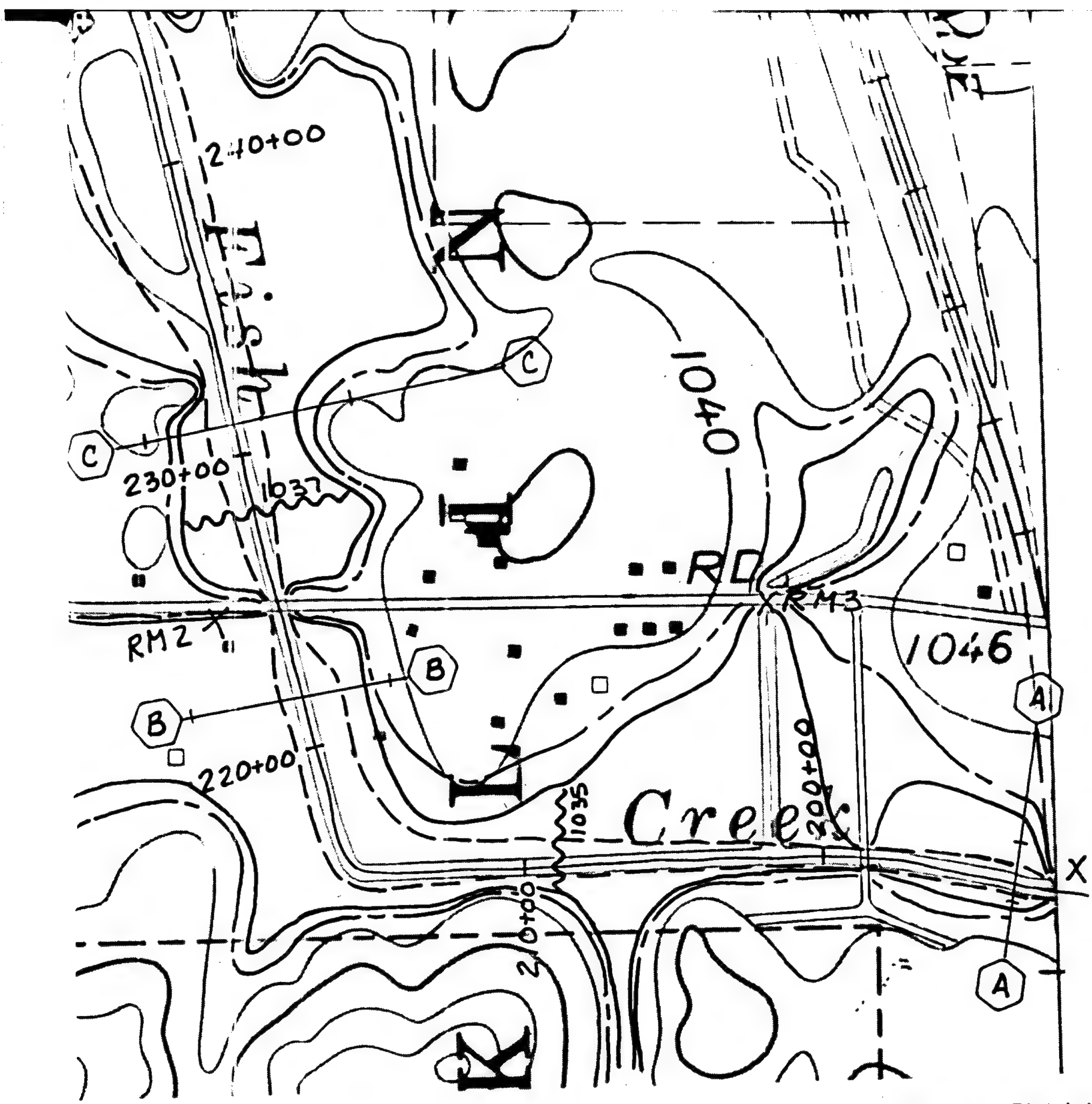
FLOODWAY BOUNDARY

1000 BASE FLOOD ELEVATION

A —— A CROSS SECTION LOCATION

RM1 X ELEVATION REFERENCE MARK

SCALE: 1 INCH = 500 FE



U.S. Army Engineer District, Buffalo
SPECIAL FLOOD HAZARD EVALUATION

ɔOUNDARY
ɜOUNDARY

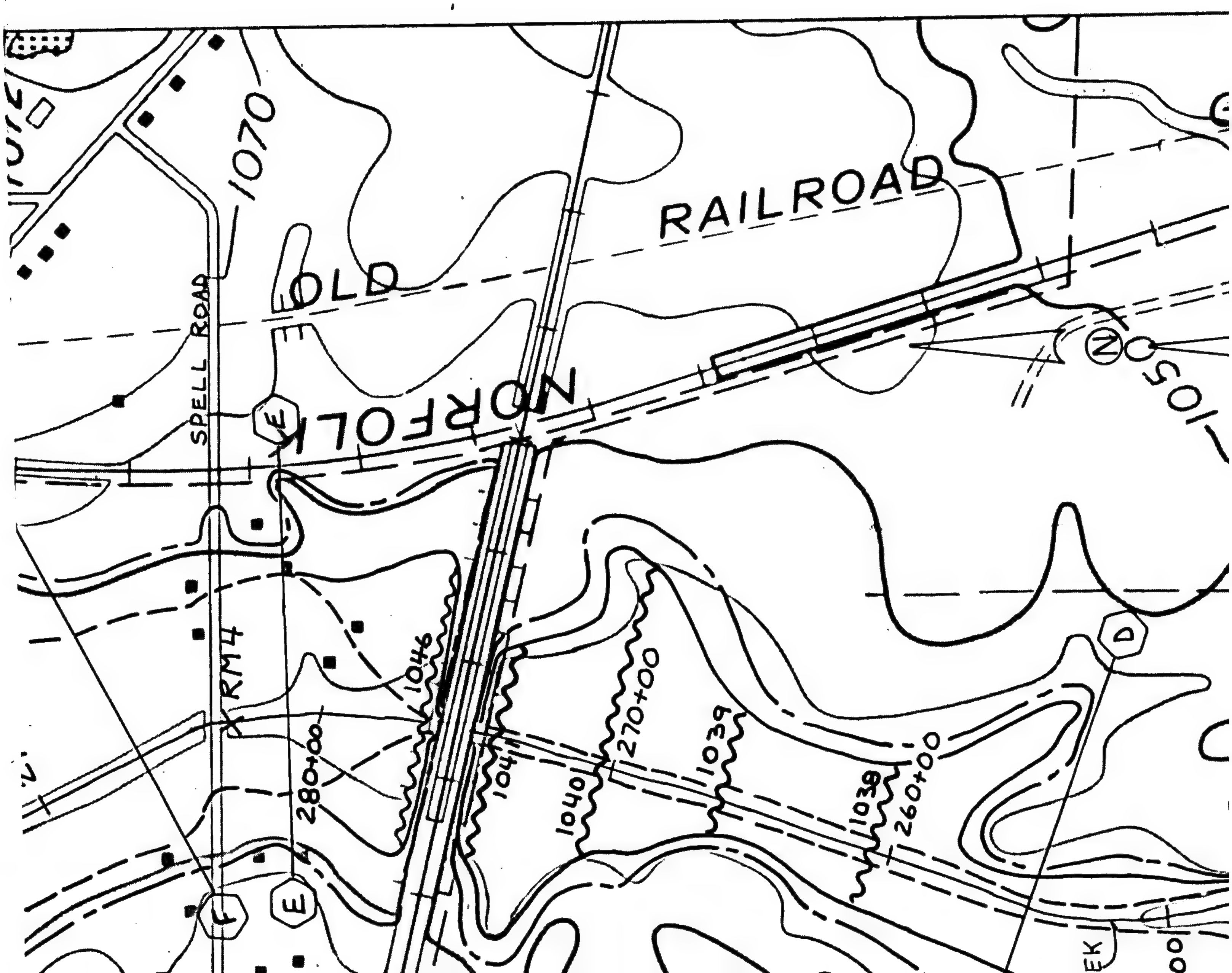
SCALE: 1 INCH = 500 FEET

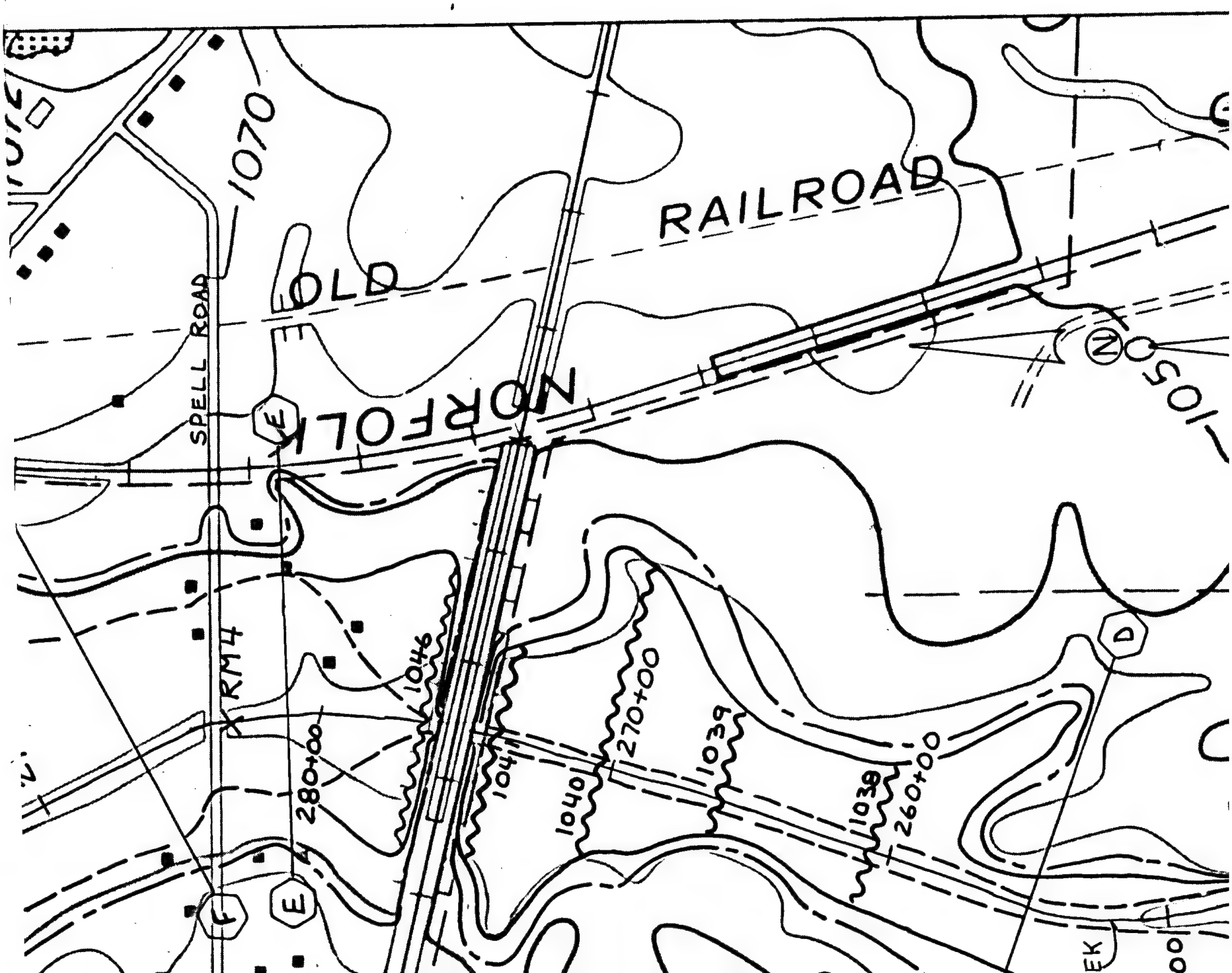
FLOODED AREA MAP
FISH CREEK
PORTAGE COUNTY, OHIO

ΓION
MARK

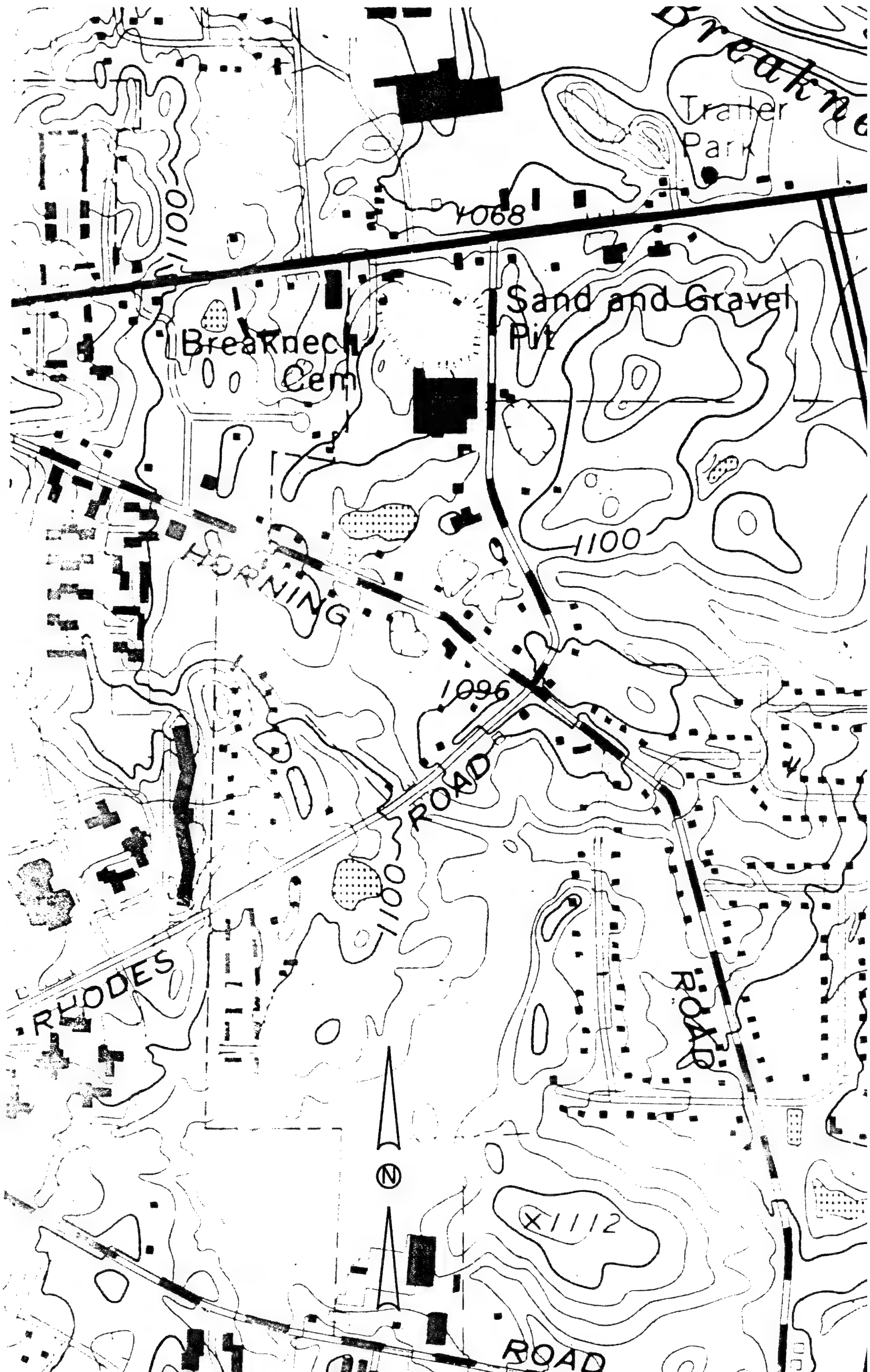
SHEET 2 OF 2

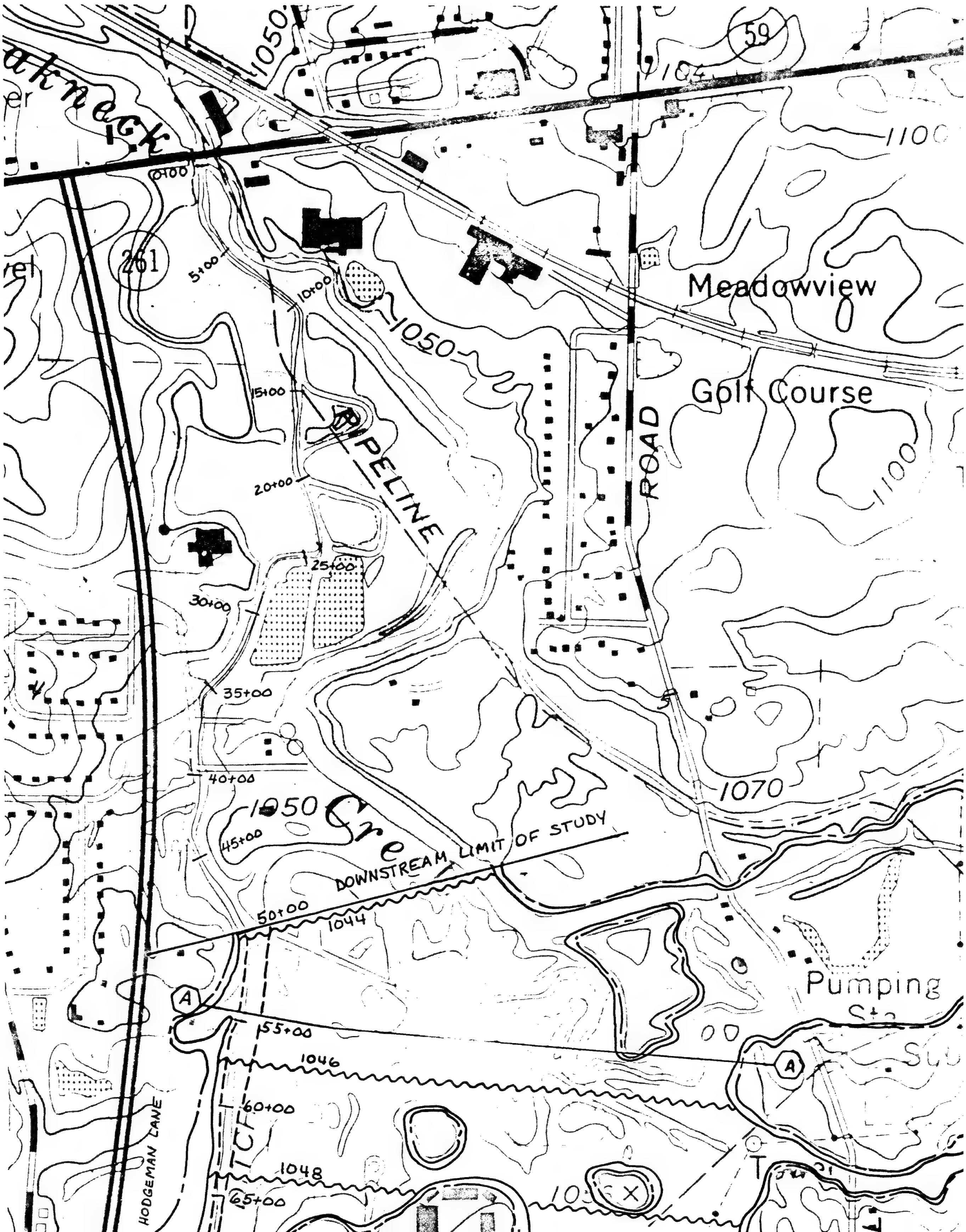
MARCH 1995


RAILROAD
OLD
NORFOLK
SPELL ROAD
1070
1050
1046
1041
1040
1039
1038
RM4
280+00
270+00
260+00
E
F
D
N
EK

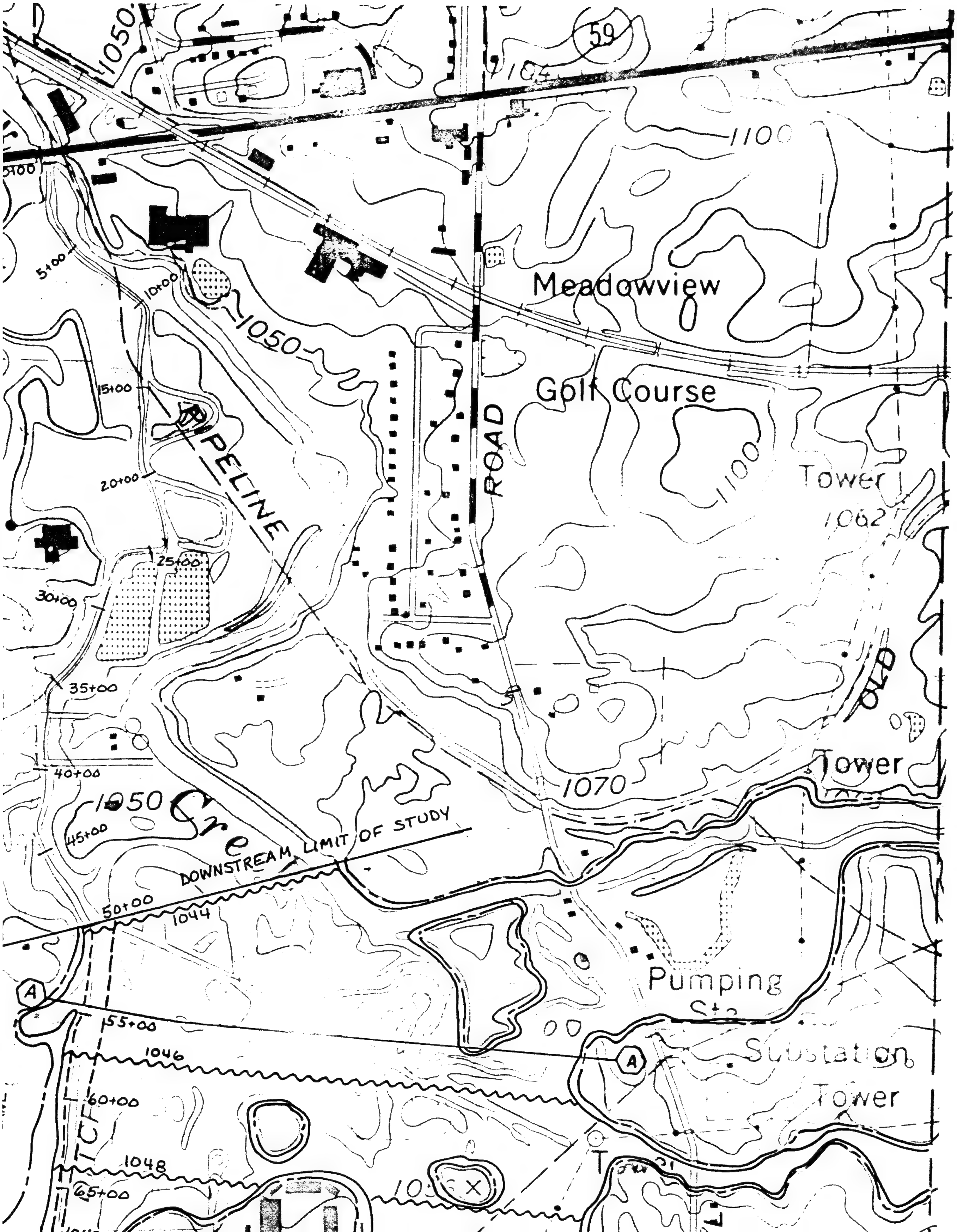


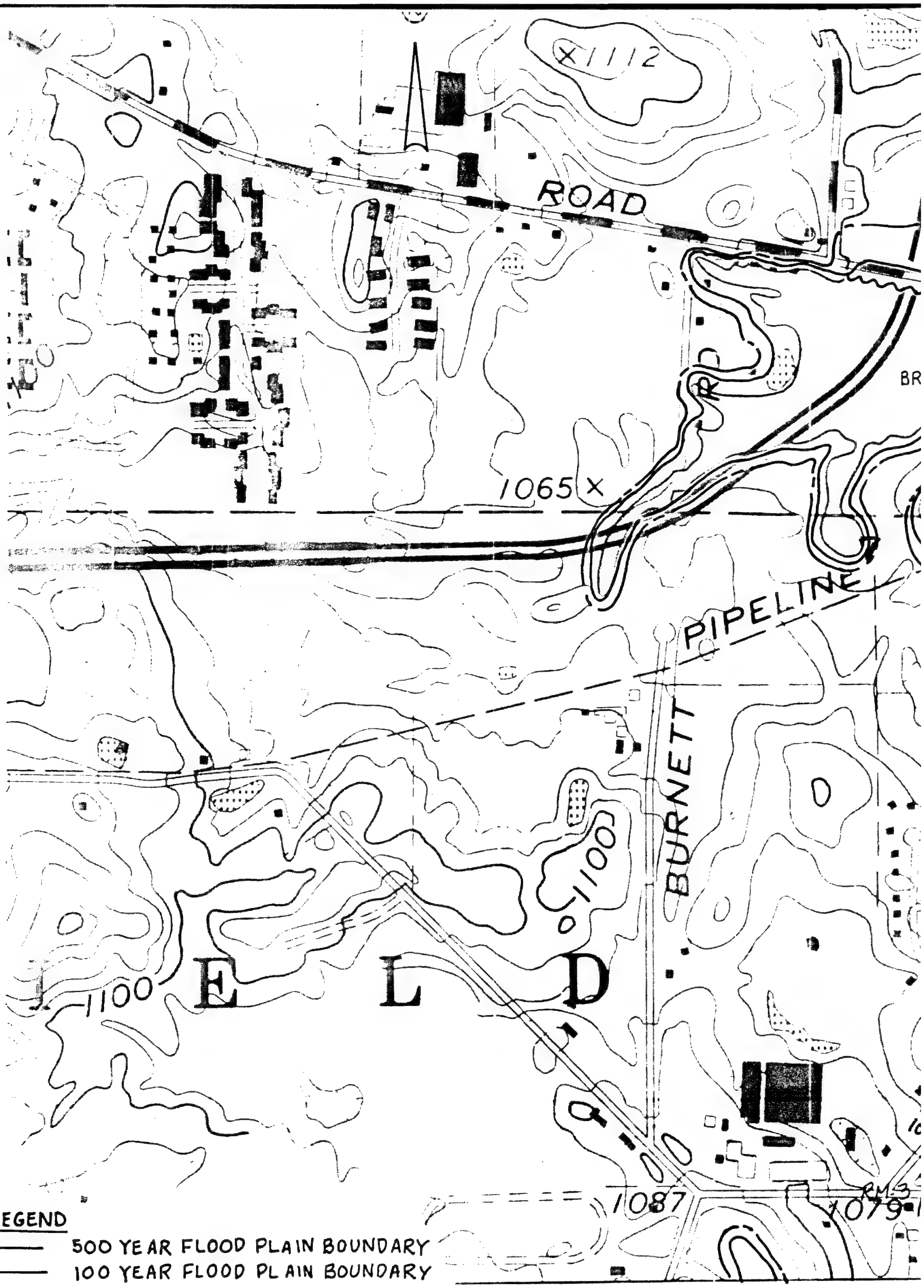
RAILROAD
OLD
NORFOLK
SPELL ROAD
1070
1050
RM4
1046
270+00
1039
280+00
1040
1038
260+00
E
D


Breakne
Trailer Park
1068
1100
Sand and Gravel Pit
Breakneck Cem
1100
HORNING
1096
ROAD
1100
RHODES
ROAD
N
X1112
ROAD



Meadowview
Golf Course
ROAD
PIPELINE
Pumping
DOWNSTREAM LIMIT OF STUDY
HODGEMAN LANE
59
261
1050
1100
1070
1044
1046
1048
0+00
5+00
10+00
15+00
20+00
25+00
30+00
35+00
40+00
45+00
50+00
55+00
60+00
65+00
A

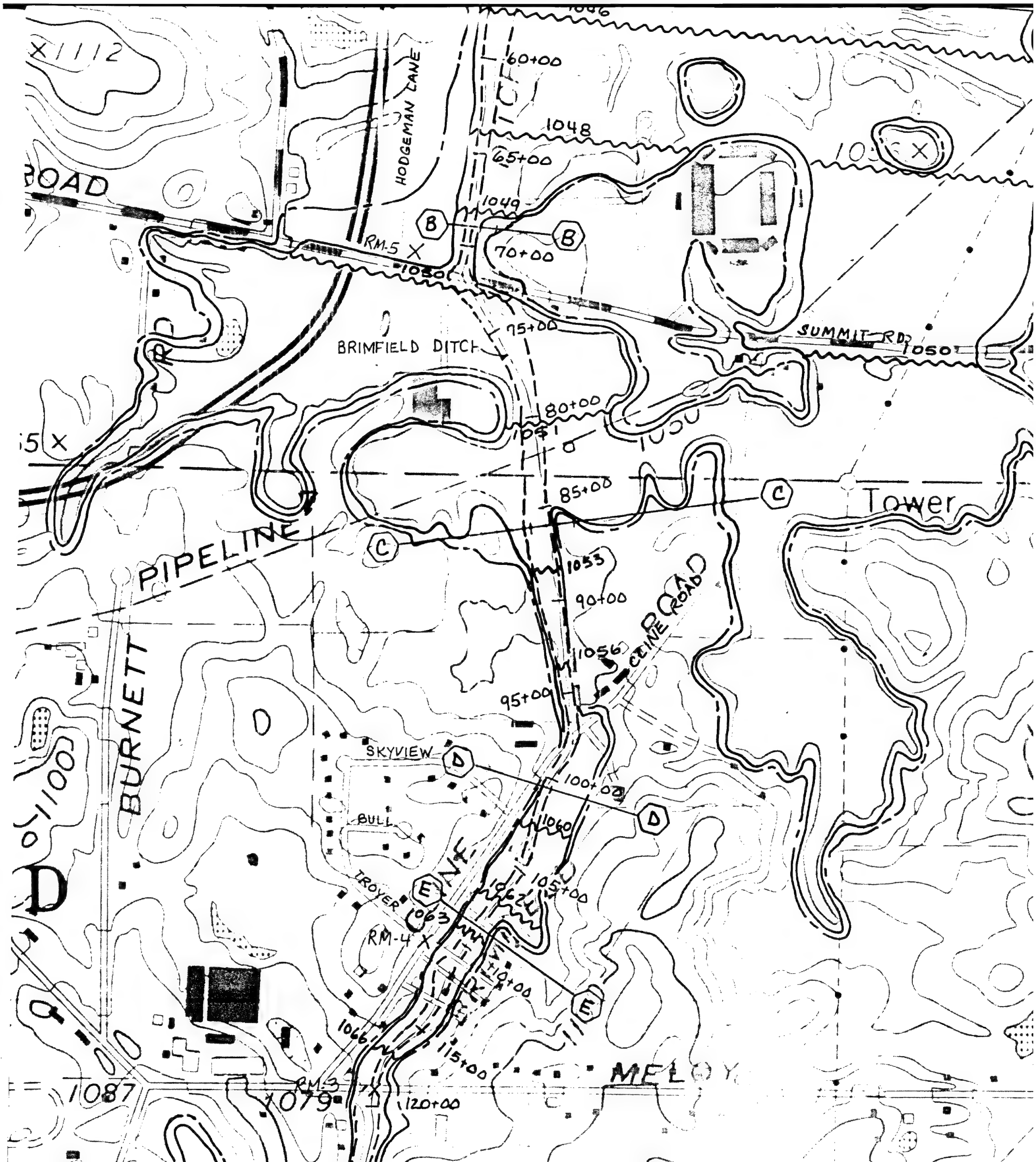

1050
59
1100
Meadowview
Golf Course
ROAD
PIPELINE
1100
Tower
1062
OLD
Tower
1070
1050
5+00
10+00
15+00
20+00
25+00
30+00
35+00
40+00
45+00
DOWNSTREAM LIMIT OF STUDY
50+00
1044
A
55+00
1046
A
Pumping
Substation
Tower
60+00
1048
65+00
TCF



LEGEND

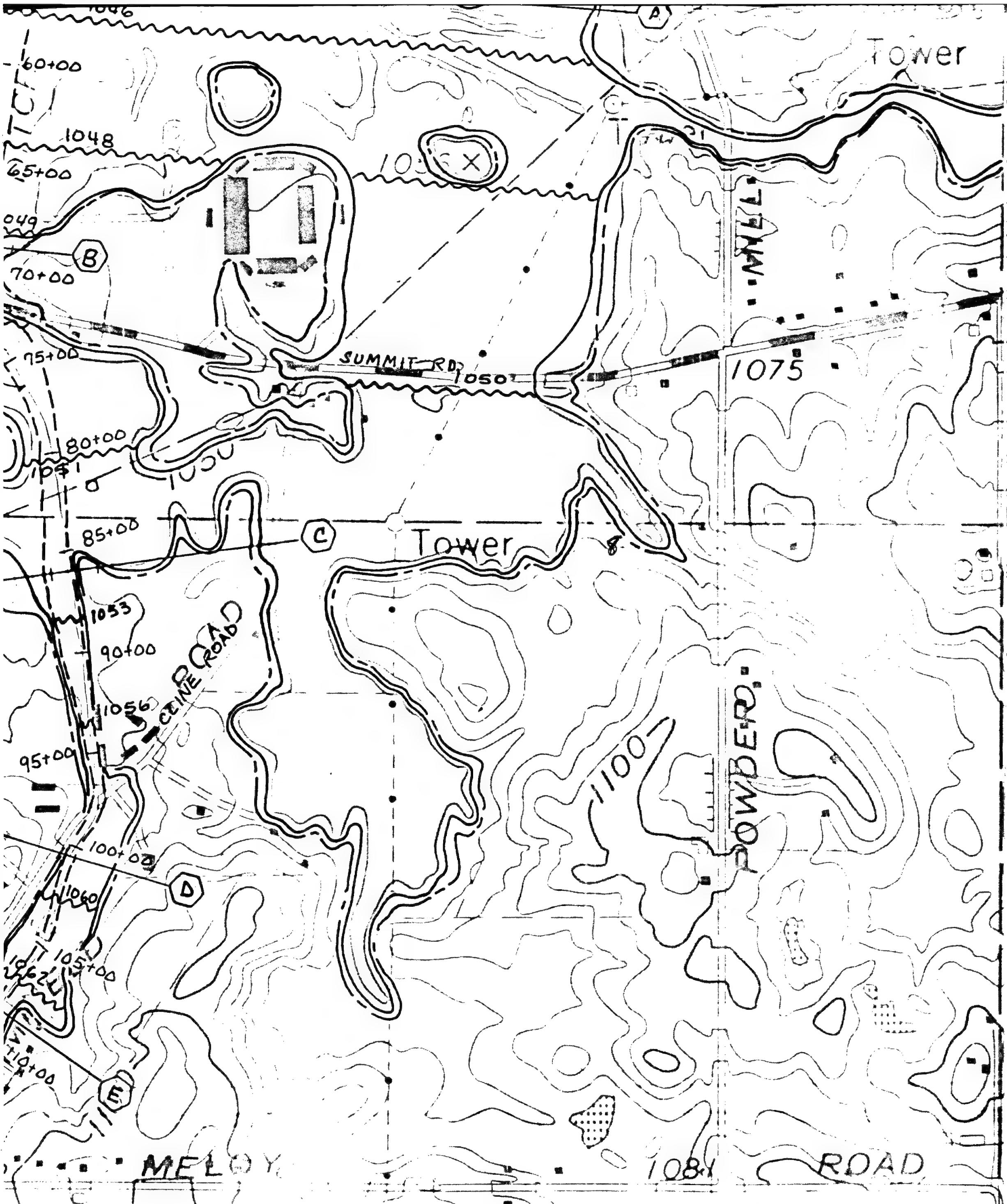
500 YEAR FLOOD PLAIN BOUNDARY
100 YEAR FLOOD PLAIN BOUNDARY
FLOODWAY BOUNDARY
1000 BASE FLOOD ELEVATION
A A CROSS SECTION LOCATION
RM 1 X ELEVATION REFERENCE MARK

SCALE: 1



MATCHES SHEET 2

SCALE: 1 INCH = 500 FEET



U.S. Army Engineer District, Buffalo
SPECIAL FLOOD HAZARD EVALUATION

MATCHES SHEET 2

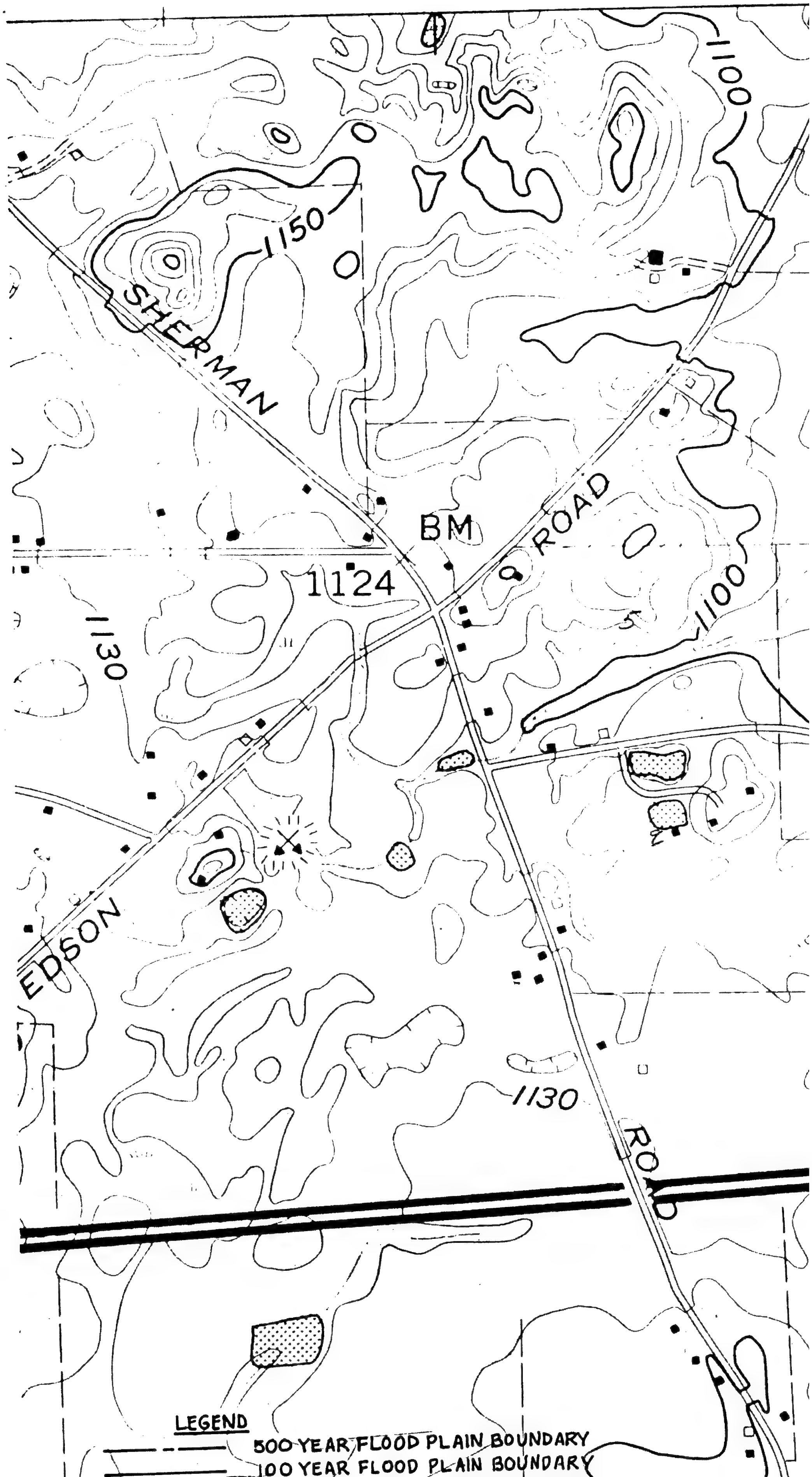
FLOODED AREA MAP

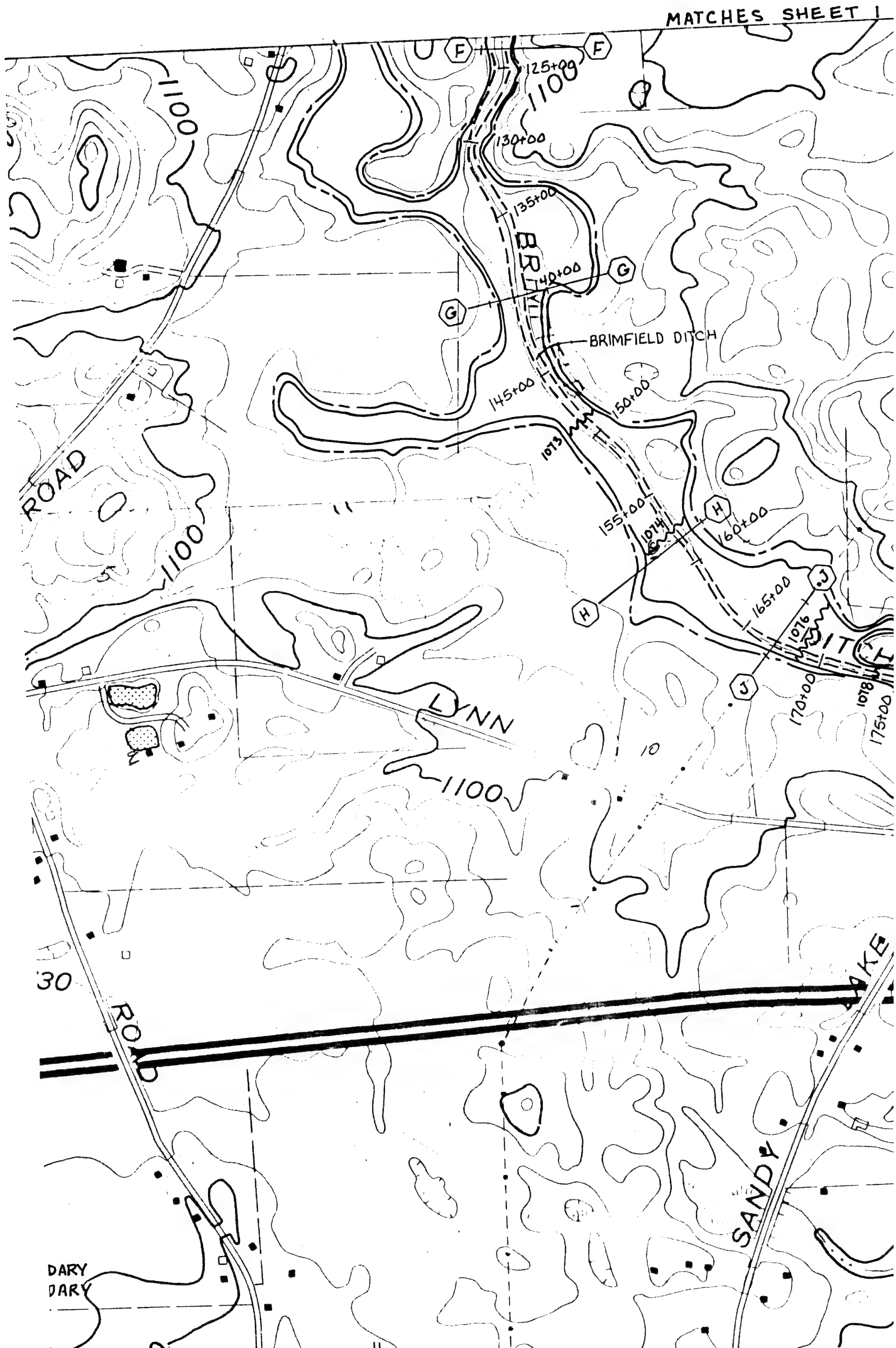
BRIMFIELD DITCH

PORTAGE COUNTY, OHIO

SHEET 1 OF 2 MARCH 1995

EET


SHERMAN
ROAD
1150
1100
BM
1124
1130
1100
EDSON
1130
ROAD
LEGEND
500 YEAR FLOOD PLAIN BOUNDARY
100 YEAR FLOOD PLAIN BOUNDARY

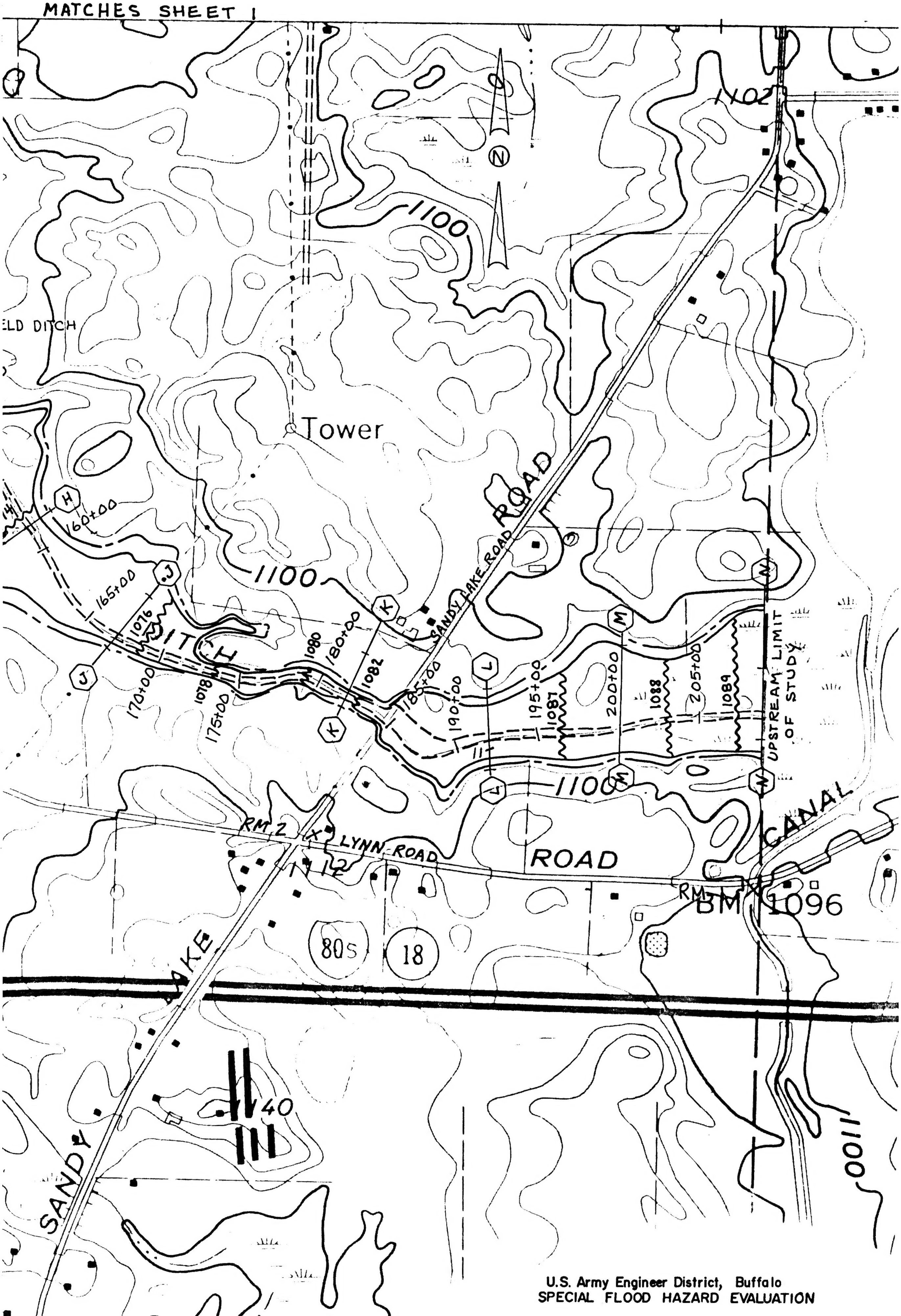


MATCHES SHEET 1
F
F
125+00
1100
1100
130+00
135+00
BR
140+00
G
G
BRIMFIELD DITCH
145+00
150+00
1073
ROAD
1100
155+00
1074
H
160+00
H
J
165+00
1076
J
170+00
1078
175+00
LYNN
1100
10
30
ROAD
SANDY
DARY
DARY

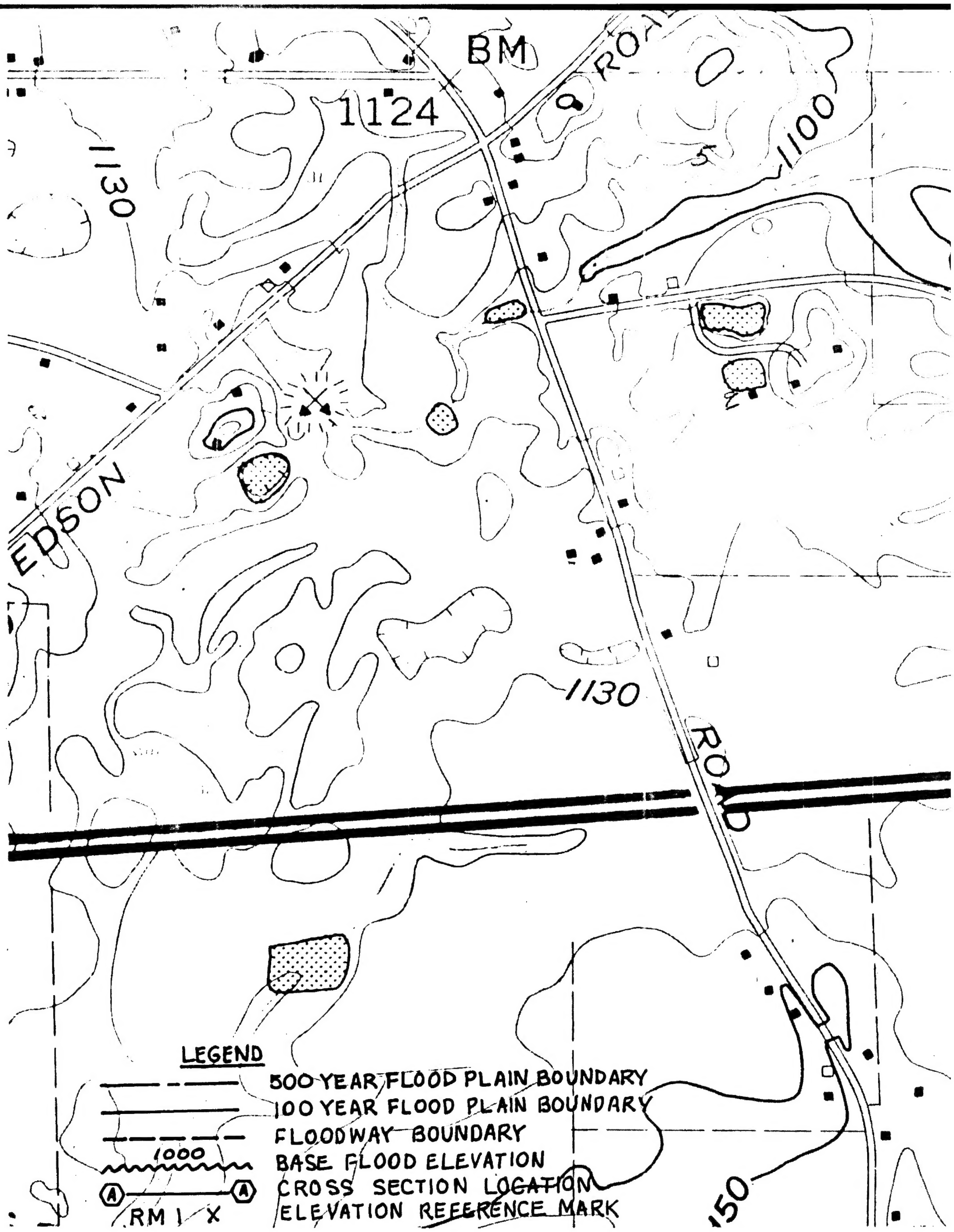
2

3

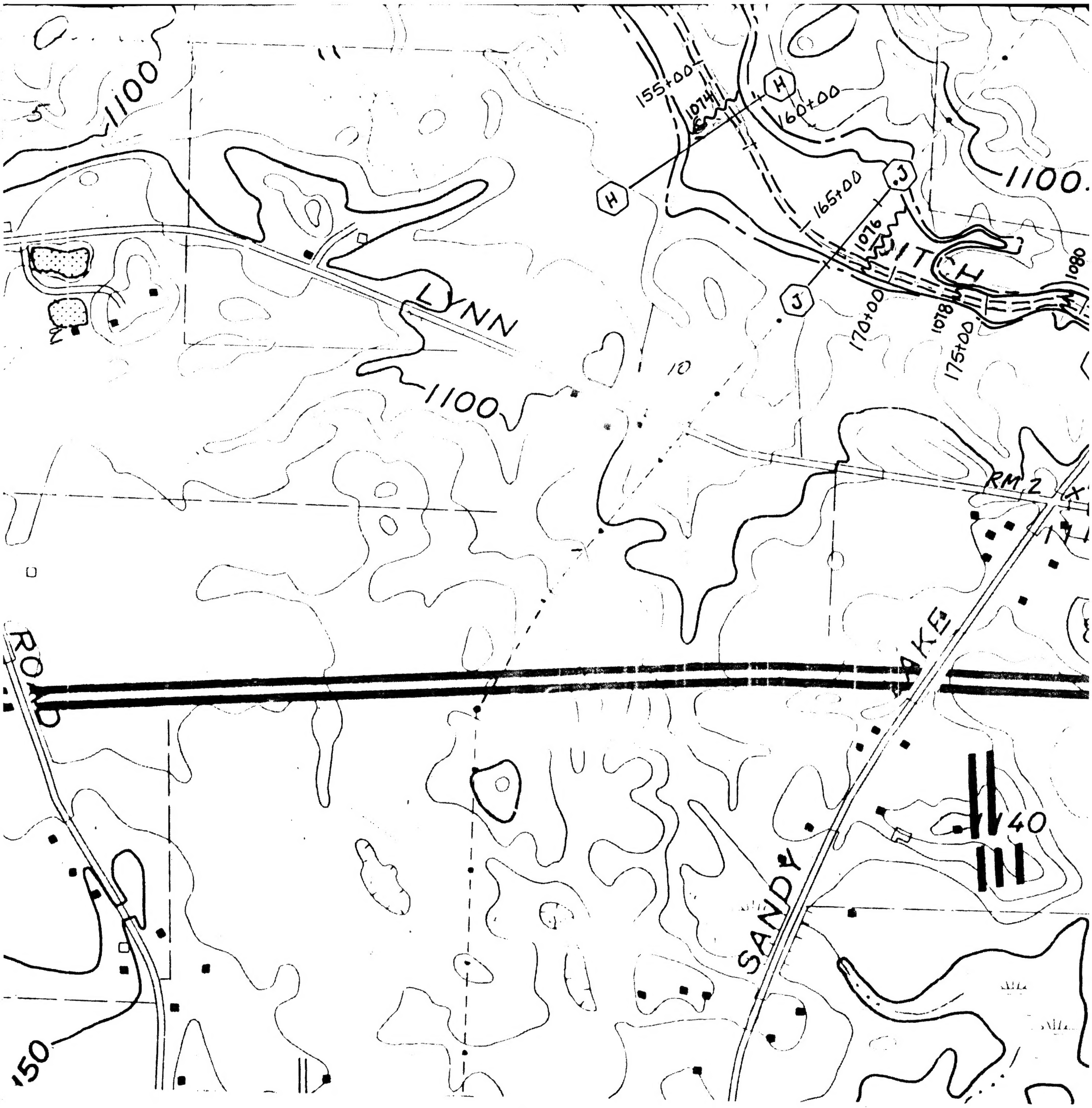
MATCHES SHEET 1



U.S. Army Engineer District, Buffalo
SPECIAL FLOOD HAZARD EVALUATION



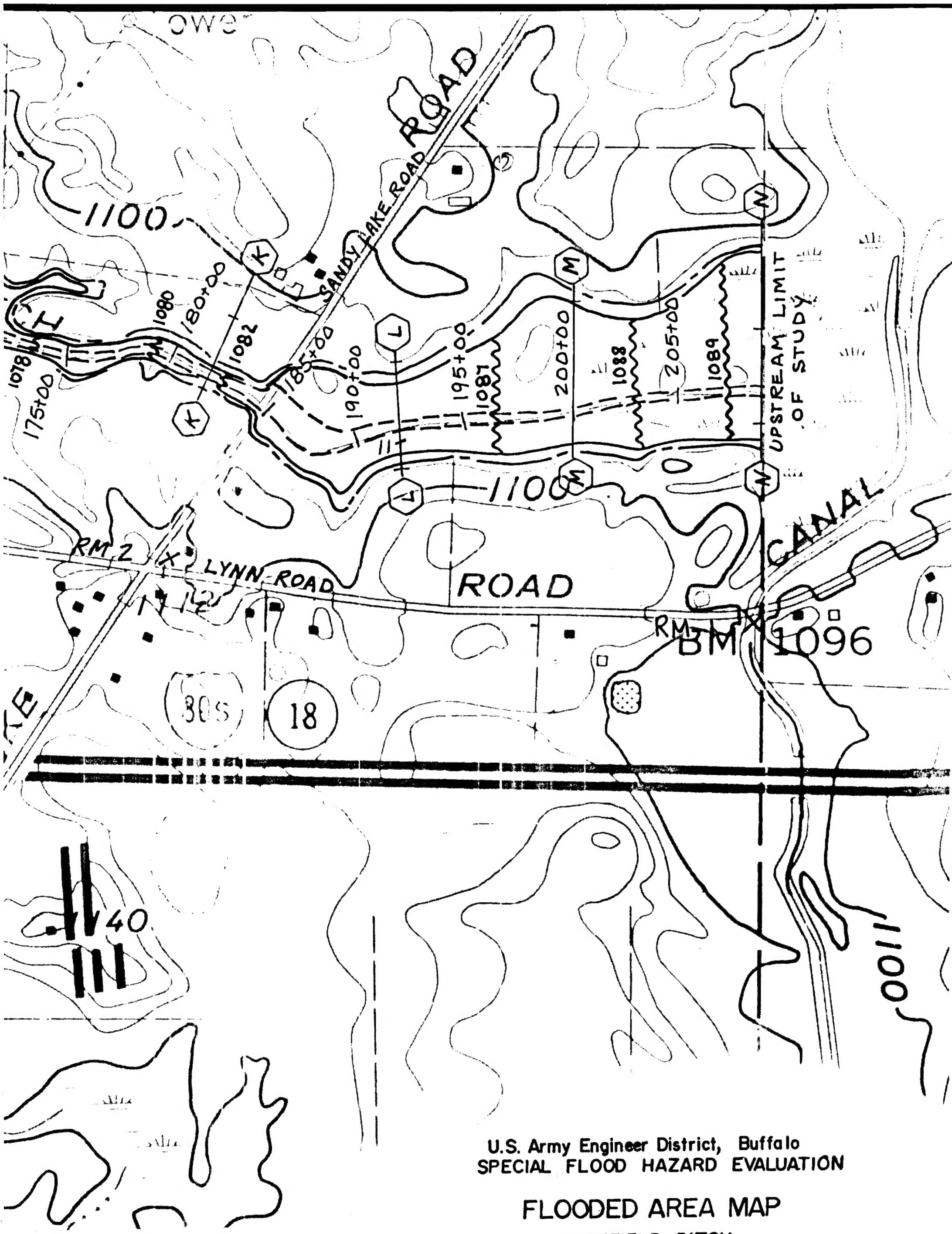
BM
1124
ROAD
1100
1130
EDSON
1130
ROAD
150
LEGEND
500 YEAR FLOOD PLAIN BOUNDARY
100 YEAR FLOOD PLAIN BOUNDARY
FLOODWAY BOUNDARY
1000
BASE FLOOD ELEVATION
A
A
CROSS SECTION LOCATION
RM 1 X
ELEVATION REFERENCE MARK



SCALE: 1 INCH = 500 FEET

8

(12)



U.S. Army Engineer District, Buffalo
SPECIAL FLOOD HAZARD EVALUATION

FLOODED AREA MAP

BRIMFIELD DITCH
PORTAGE COUNTY, OHIO

SHEET 2 OF 2 MARCH 1995